Ripple Effects
Robert Birkenholz .................................................................1

Competencies and Experiences Needed by Pre–service Agricultural Educators to Teach Globalized Curricula: A Modified Delphi Study
Nathan Conner & T. Grady Roberts ...........................................8

Evaluating the Effectiveness of Traditional Training Methods in Non-Traditional Training Programs for Adult Learners through a Pre-test/Post-test Comparison of Food Safety Knowledge
Caleb D. Dodd, Scott Burris, Steve Fraze, David Doerfert & Abigail McCulloch .........................................................18

Student Motivation for Involvement in Supervised Agricultural Experiences: An Historical Perspective
William A. Bird, Michael J. Martin & Jon C. Simonsen .................................................................31

The Influence of Collaborative Reflection and Think-Aloud Protocols on Pre-Service Teachers’ Reflection: A Mixed Methods Approach
Cory M. Epler, Tiffany A. Drape, Thomas W. Broyles & Rick D. Rudd .........................................................47

The History of Future Farmer Organizations Around the World
James J. Connors ..................................................................60

Leadership Curriculum and Materials Used by High School Agricultural Science Teachers: A National Study of the Pre-Life Knowledge Days
A. Christian Morgan, Nicholas E. Fuhrman, Diana L. King, Frank B. Flanders & Rick D. Rudd .........................72

How Are We Educating Agricultural Students? A National Profile of Leadership Capacities and Involvement in College Compared To Non-Agricultural Peers
David M. Rosch & Natalie Coers ................................................83

Teacher Behaviors Contributing to Student Content Engagement: A Socially Constructed Consensus of Undergraduate Students in a College of Agriculture
Christopher M. Estepp & T. Grady Roberts ..................................97

Identification and Validation of Agricultural Hazardous Occupations Order Certification Program Instructor Criteria and Competencies
Shannon Snyder, Brian French, William Field, Roger Tormoehlen & Daniel Ess .............................................111

Investigating the Effects of a Math-Enhanced Agricultural Teaching Methods Course
Christopher T. Stripling & T. Grady Roberts ..................................125

The Effect of Human Capital on Principals’ Decisions to Interview Candidates in Agricultural Education: Implications for Pre-service Teachers
J. Shane Robinson & Marshall A. Baker ........................................140

A 20-Year Comparison of Teachers’ Self-Efficacy of Agricultural Mechanics Laboratory Management
Billy R. McKim & P. Ryan Saucier ..............................................153

Two Decades of Agricultural Literacy Research: A Synthesis of the Literature
Kristin A. Kovar & Anna L. Ball ..................................................167

Assessing the Impact of a Semester-long Course in Agricultural Mechanics on Pre-service Agricultural Education Teachers’ Importance, Confidence, and Knowledge of Welding
Brian L. Leiby, J. Shane Robinson & James P. Key ..........................................179

Variable Relationships Affecting Agriscience Teachers’ Stages of Concern for Content Area Reading Strategies
Anna J. Warner & Brian E. Myers .............................................193

An Analysis of FFA Chapter Demographics as Compared to Schools and Communities
Shannon Lawrence, John Rayfield, Lori L. Moore & Corliss Outley .................................................................207
Ripple Effects

Robert J. Birkenholz,
The Ohio State University
Distinguished Lecture, American Association for Agricultural Education
May 16, 2012

Dr. Robert J. Birkenholz is a Professor of Agricultural and Extension Education in the Department of Agricultural Communication, Education, and Leadership (ACEL) at The Ohio State University. In 2002, he was appointed Chair of the department and served in that administrative role for two terms. In 2009, Dr. Birkenholz returned to a full-time faculty position in the department where he helped guide the creation of the undergraduate, interdisciplinary minor in Leadership Studies. Dr. Birkenholz has co-authored one book and one book chapter, 41 peer reviewed journal articles, 53 refereed research papers, and numerous other scholarly publications. He has taught a variety of courses in Agricultural Education and Leadership at the undergraduate and graduate levels. He has advised 59 Master’s and 23 doctoral degree graduates. Dr. Birkenholz served as President of the American Association for Agricultural Education (AAAE) and was inducted as an AAAE Fellow in 1998. He received the AAAE North Central Region Outstanding Agricultural Educator award in 2011. He has presented lectures on student-centered learning and leading change at the four state agricultural universities in India. He was recognized in 2008 as a Fellow in the Kellogg Food Systems Leadership Institute.

Keywords: teacher influence, professional development, career development

Thank you for the honor and privilege to be with you here today to present the 2012 AAAE Distinguished Lecture. For the past 30 years I have looked forward to this part of the program with great anticipation. Each year I have tried to guess the identity of the speaker by surveying the crowd to anticipate who might have been selected to deliver the lecture. Most of the time I focus on the wrong person, and get surprised when the name of the speaker is finally revealed. This year the process was a little different for me. Although I didn’t have to wait to learn the name of the speaker . . . I still experienced some anxious moments as Greg Thompson revealed hints about my identity.

When Greg called me last summer, I vividly recall that I was in a pontoon boat on Clear Lake in northern Iowa. The weather was perfect and I was enjoying a cold beverage as my niece steered the boat around the lake with several other family members aboard. I nearly had to pinch myself to make sure that I wasn’t dreaming, because everything seemed so perfect . . . I thought that I surely must have died and gone to heaven. However, Greg brought me back to my senses and assured me that I was not dreaming. Nevertheless, I feel very blessed to have been asked to present the Distinguished Lecture this year. This opportunity is somewhat of a “Bucket List” item for me, and I cannot fully express the depth of my gratitude for being asked to serve as the “Mystery Speaker.” It is indeed both a daunting and humbling experience, as many of the past speakers have acknowledged.

For several years I have pondered the topic that I would speak on, if I were ever selected to present this lecture. However, after Greg’s phone call, I felt compelled to focus on a topic that is very near and dear to my heart, and that is leadership. Not from an academic perspective, but more from a personal point of view.

I have selected the title of “Ripple Effects” for my talk based on an analogy that can be applied to the subject of leadership and especially how leaders influence others, through a ripple effect. However, before I delve into my comments this morning, I would be remiss if I
didn’t say THANK YOU to a few people who have had a tremendous influence on my life, both personally and professionally.

First and foremost, I want to publicly acknowledge my life’s partner – Pam Birkenholz. Pam has been my wife, friend, partner, cheerleader, confidant, and recently my nursemaid . . . in addition to being my very own personal financial planner . . . she frequently reminds me that I am her best customer! Last summer she surprised me at a park near our home in Dublin, Ohio where she had arranged for our two sons, their wives, and our four grandchildren to be present (along with one of her co-workers, who just happened to be an ordained minister) . . . and we renewed our wedding vows. This August we will celebrate our 35th wedding anniversary. One bit of trivia that Greg did not mention was that I asked Pam to marry me only two weeks after we first met in 1976. I want to take this opportunity to publicly acknowledge Pam for all of her love and support through all these years. Thank You! [Using American Sign Language, gestured to Pam: “eye, love, you,” a family custom when communicating with grandchildren on Skype.]

I also would like to express my gratitude to AAAE President-elect, Dr. Greg Thompson, who assumed a professional risk when he invited me to deliver the Distinguished Lecture this year. Greg has always been a great friend since we first met when he was a graduate student and I was on the faculty at the University of Missouri in the mid-1990’s. Greg and his wife Rita are good friends, and we engage in friendly competition for “Grandparent of the Year” honors with regard to our adopted grandchildren, especially Josiah Velez who turns five this year. Pam and I had to transfer our grandparenting rights to Greg and Rita when Josiah’s parents (Jonathan and Tracy Velez) left Ohio State and moved to Oregon State after graduate school a few years ago. Something similar occurred when Jon and Michelle Simonsen moved to the University of Missouri nearly two years ago with their two sons (Nick and Carter) . . . since then, Pam and I have experienced a void as pseudo-grandparents within our extended Ag Ed family. Jonathan Velez is not here as he and Tracy are home caring for Anna Joy who was born two months ago. On a side note, I would also like to say Happy Birthday to Glenn Shinn who celebrated his birthday yesterday.

Next, I would like to express appreciation for three professional colleagues . . . although I don’t believe any of them are present in the audience today . . . for each of them has served as a mentor to me at various points in my career. Although each of them served as professional role models, they also had a profound influence on my personal life as well. Dr. Alan Kahler was my doctoral program advisor at Iowa State University. Dr. Bob Stewart was a colleague on the faculty in agricultural education at the University of Missouri. Dr. L. H. Newcomb provided administrative leadership at the college and departmental levels at The Ohio State University. Each of these individuals, along with countless others too numerous to mention, have served as informal mentors, and as a result, directly influenced my life, both personally and professionally. I feel a deep sense of gratitude and would like to publicly thank each of them for their positive influence on me at various stages of my career.

The last group that I would like to thank includes some of you in the audience today. So before you begin to doze off, or start checking email and texts messages on your cell phones, please permit me to engage in an audience participation exercise. I ask those of you in the audience to stand and remain standing, if you were ever: (a) enrolled in a class that I taught, (b) were advised by me as an undergraduate or graduate student, or (c) had me serve as a member of your graduate program advisory committee. If you meet one or more of these three criteria, please stand and remain standing for a moment. As we look around the room, this group represents some of the people in our profession that I have had some direct contact, and potentially influenced their professional growth and development in some small way. Please know that my purpose for this exercise is not to inflate my own ego, for I know many of you in this room would have a much larger group of professional colleagues standing if you had made a similar request. My purpose here this morning is to illustrate the ripple effect that one person can have after just a few years in this
profession. Nevertheless, for those of you who are still seated, look around this room and please stand if you have either been taught or advised by any of the people who are already standing in the first group. Again, please stand and remain standing. This extended group illustrates the second wave of the ripple effect that occurs as faculty in our program work with students over a period of years. Henry Adams succinctly captured the essence of this concept with his quote: Teachers affect eternity; you can never tell where their influence stops. This is a visual illustration of the topic that I will address in my comments this morning, again, based on the title of Ripple Effects. Thank you for your involvement with this exercise. Feel free to take your seats.

Let me start this morning by establishing the general context for the topic. Each of us, in the daily routines of our lives, fulfills our roles and responsibilities with varying degrees of intentionality. We tend to be very purposeful and intentional with respect to our teaching, research, and outreach roles. But we may not fully recognize and appreciate the potential influence and impact that we have on those around us in less formal situations. As current or future faculty members, or as colleagues in other professional roles, we have numerous opportunities to interact with many people through our daily interactions. It is important that we recognize the enormous potential we have to motivate, guide, and influence our students, advisees, peers, and even our supervisors and administrators each and every day.

Although this lecture began with me expressing appreciation for those who have touched my life in the past, I am reminded of the legendary football coach at Ohio State, Woody Hayes, who has become a folk hero with regard to some of his philosophical principles. Woody believed that it was not so important to pay someone back for their good deeds that they have done . . . Coach Hayes believed in the power of Paying It Forward . . . Paying It Forward is what I hope to accomplish with each of you in the time that I have this morning. My goal is to Pay It Forward with regard to an important leadership concept that I learned several years ago, hoping that I can create a ripple effect among you, which will subsequently ripple outward as you influence others around you back at home.

The key point of my message today is that we recognize the potential ripple effect that we have on those around us. Although we may only be able to observe the direct influence that we have on people in our immediate circles, we can also create circles of influence that ripple outwardly toward others, even though we may not have direct contact with them.

Another characteristic of the ripples that are created when you toss a stone into a body of water is that the concentric circles reflect a symmetrical balance, which can continue for a period of time and slowly fade away. However, if there are barriers present, the ripples tend to be short-lived and dissipate rather quickly. The ripple effect analogy can also be applied to our personal and professional lives. The ripples in our lives that are smooth and symmetrical are a reflection of our success and self-satisfaction, which enhances our potential to exert a positive influence on others. Although we each fulfill various roles in our professional, personal, social, and family lives . . . we are one person; which is the common denominator in our ripple effect analogy . . . each of us is like a stone tossed into a pond . . . which produces the first ripple. We do not know when, where, or how long those ripples will last, but they have the potential to influence many other people as they move outward simultaneously, in all directions.

As I mentioned earlier, we each fulfill different roles in our personal and professional lives; however it is important for us to be the same person in each of those roles. It is unnecessary and unhealthy to create a personal identity that is unique to each role. Some of you may have observed friends or colleagues who strive to maintain identities that are unique to each of their life roles. My advice on this topic is straightforward and simple, be the best person that you can be and be the same person in each of your life roles. My advice on this topic is straightforward and simple, be the best person that you can be and be the same person in each of your life roles. It takes enormous personal effort and creates unhealthy personal stress to maintain a professional identity that is different than your personal identity. Living with integrity (which is the most basic foundation of
effective leadership) implies that we are genuine and consistent in our behavior. In doing so, we must avoid projecting a façade that does not reflect the true nature of who we are as a person, regardless of the context.

Let me now return to a comment that I made earlier about the importance of balance in our lives. Several years ago, as a young Assistant Professor, I recall attending a meeting that included a presentation by Carl Clayton who was a professional development and public relations specialist with A. O. Smith Harvestore, Inc. Mr. Clayton’s presentation was an eye-opening experience for me as he presented a compelling case for living a balanced life. Carl identified seven key dimensions in life and emphasized the importance of each dimension to our overall success in life, not measured by how much wealth we had accumulated or how hard we worked, but measured by our sense of personal satisfaction and fulfillment with our life as a whole.

The seven dimensions were illustrated as spokes on a wheel, labeled as: Physical, Social, Mental, Spiritual, Financial, Career, and Family. The first four dimensions (mental, physical, spiritual, and social) were defined as foundations (essentially cornerstones) for living a full and satisfying life. However, the other three dimensions (career, financial, and family) are where many of us invest much of our time, energy, and resources as we seek climb the ladder of success. In the few minutes remaining, I would like to briefly examine each of these dimensions and then summarize with some thoughts about the importance of seeking balance among them.

Let’s start with the Physical dimension. It should be fairly clear to all of us, that maintaining our personal health is an important factor that has a long-lasting and cumulative effect on our personal and professional well-being. Health and wellness have become a high priority in our society as we recognize the relationship between personal health and well-being, both personally and professionally. Having recently undergone surgery for prostate cancer, I can attest to the importance of healthy living by eating right, exercising, and avoiding unhealthy behaviors. Smoking, binge drinking, and illicit drug use are extreme examples of unhealthy behaviors; but we should also recognize the danger of even moderately unhealthy behaviors over the long term. So my question to you is this: What are you doing on a regular basis to monitor and improve your physical health? Clearly, long term career success is dependent upon good health and each of us is responsible for maintaining our health by living a healthy lifestyle.

The Social dimension is also very important based on the fact that as humans, we are all social creatures. We each have the need to interact with others on an informal basis to lead full and satisfying lives. Social interaction often occurs through communication with friends and colleagues, both within and outside the work environment. Socializing is a mechanism that allows people to relax, reenergize, and overcome anxieties commonly associated with our personal and professional roles. Emerging technologies such as cell phones, email, and social media appear to enhance opportunities for socialization, at least virtually; however it is not clear if electronic communication replaces our need for interpersonal socialization. Are you maintaining contact with a circle of close friends, and/or neighbors that strengthens the social dimension of your life? Without a supporting network of social contacts, we often become too narrowly focused on our careers. Upon retirement, is it reasonable to expect to be able to establish a social network outside the work environment that has not been cultivated in prior years? Human beings are social creatures, and we each need to take time to develop and maintain social contacts beyond our workplace and career contexts.

The third area identified in Clayton’s Wheel of Life was labeled the Mental dimension. People benefit from mental stimulation that challenges their ability to think, process information, and make decisions.
Clearly, mental processing follows the saying “use it or lose it” whereby individuals who are not challenged to grow in their personal or professional lives, seem to suffer from a reduced ability to think rationally in a changing world. Mental stimulation can occur in a wide variety of settings from classrooms to research labs to individual conversations; however, it is clear that when individuals avoid challenging their mental capacity, atrophy can result. Have you read a good book or attended a stimulating lecture recently . . . simply for pleasure? Or how about taking time away from your work to clear your mind in order to return with a renewed sense of energy, purpose, and vision? Sometimes, we become victims of our heritage, and the strength of our work ethic causes us to overlook the periodic need to recharge our mental batteries. Some like to jog . . . others play golf . . . what activities do you enjoy that contribute to your mental health?

The fourth dimension identified by Clayton regarding Spirituality often causes people to squirm in their seats. Many people equate spirituality with religion. Although the spiritual dimension encompasses religion, spirituality is a broader concept. The Spiritual dimension assumes the existence of a higher power in the universe, and that each of us has been placed on this earth to serve a purpose. Seeking to define one’s purpose in life and to pursue that calling is prerequisite to achieving self-satisfaction. Failing to define one’s purpose in life can result in feeling empty and unfulfilled, questioning our existence on this earth. Achieving a sense of balance in our spiritual life involves recognizing who we are as a person and why we exist on this earth. For example, I have concluded that my overall purpose in life is simply to help others be successful. Gaining that perspective has been helpful as I fulfill my roles as a husband, father, teacher, and advisor . . . along with many other roles that I have in life. Knowing what I perceive as my purpose . . . helps me to balance the spiritual dimension in my life. Do you have a clear picture of your purpose in life? Think about times when you felt the greatest sense of fulfillment or satisfaction in your life. Those times provide clues regarding your life’s purpose. Once identified, it is stimulating to think about your roles and responsibilities in the context of serving a higher purpose. Clearly defining a purpose for your life will have a profound effect on how you live and how you interact with those around you.

As I mentioned earlier, the first four dimensions (Physical, Social, Mental, and Spiritual, which equate to body, heart, mind, and soul) are foundational cornerstones that require some degree of balance for us to achieve a sense of self-satisfaction and personal fulfillment in life. Neglecting any one of those dimensions over the long run can have negative implications and potentially jeopardize your potential for success and personal fulfillment. Although balancing the four dimensions will not guarantee self-satisfaction . . . imbalance among those dimensions often results in feeling that life is not all that it could be . . . that something is lacking.

Likewise, overinvesting in one of these dimensions at the expense of another can result in serious consequences. For example, many times our students tend to emphasize the mental and social dimensions of their lives, but neglect the physical and spiritual dimensions. Over time, such an imbalance may result in an assortment of health problems and or soul-searching, leading them to question decisions about their career path. Ultimately, each of us needs some degree of balance among the four foundational dimensions in order to achieve a sense of personal satisfaction and fulfillment in our lives.

The last three dimensions that I would like to discuss this morning include career, financial, and family. Career is an easy dimension to address in this context because we often place high emphasis and expend our personal time and energy on advancing our careers, or career preparation in the case of students. For many of us, our personal identity is closely linked to our professional identity. This is especially important when you begin to contemplate retirement at some point in the future, by asking: ‘Who am I?’ after I retire. If I am no longer a professor, a teacher, an advisor, a researcher, etc. then how do I define myself as a person? Again, a healthy balance between our personal and professional lives is necessary for us to achieve satisfaction and fulfillment in life. Are
you keeping your career in proper perspective with regard to the other dimensions? Are other dimensions being sacrificed by an over-emphasis on your career? Often, it is the family and physical dimensions that suffer. Again, balanced living is the key to long-term fulfillment and satisfaction in life.

The **Financial** dimension is another area that is very personal in nature and not openly discussed in professional circles. However, we are each responsible to be stewards of our resources. We are responsible for managing our personal and professional resources, both now and in the future. Specifically, that means that we need to be able to support ourselves, live within our means, manage our spending, save for the future, and plan for long-term goals. Social security and pension plans are great programs; however, we need to manage our financial resources in order to help us achieve our personal and professional goals. One tip that I learned several years ago was to redirect a portion of my merit raise each year into a personal savings account or IRA, based on the assumption that I wouldn’t feel the pain of reducing my income if the funds were diverted before they ever appeared in my pay check. Following this strategy, Pam and I have helped to fund three undergraduate scholarships at Iowa State, Missouri, and Ohio State in our desire to “Pay It Forward” with respect to the educational opportunities and professional support that I received from each of those institutions. Over time, by re-directing a small portion of my salary increase each year to fund those scholarships, we have made a real difference in the lives of undergraduate students at those institutions -- literally for eternity -- another good example of the ripple effect created by Paving It Forward! Do you have clear goals for your financial future? Have you developed strategies to achieve those goals? There are many different programs and resources available to help us make good financial decisions . . . however, each of us has the ultimate responsibility to live within our means and plan for our financial future. The key is don’t procrastinate – start today!

Family is the seventh dimension that Carl Clayton identified that contributes to a sense of fulfillment in our lives. Although we each have unique circumstances in our families, the key point is the connection and commitment that we have to our family members. Spouses, children, parents, siblings, and other family members . . . each provide blessings and challenges that influence our sense of satisfaction in life. For some, we have an extensive family and are challenged to maintain meaningful relationships with all of them. For others, we may have smaller families or live some distance away from them. Regardless of the size and scope, the important question is the quality of the relationship that you have with your family. Do you experience a satisfactory and fulfilling relationship with your family? Or do you feel estranged from one or more family members? Once again, this is a difficult topic to address openly; however it is clear that we are not able to compartmentalize our professional lives, separate and distinct from our personal lives. If we have family relationships that create stress in our personal lives, ultimately that stress can carry over into our professional lives, influencing our performance and productivity if left unresolved. Family members serve as a great source of support and encouragement when we face challenges or difficulties in our professional roles. However, there may be times when family situations distract our attention and divert our energy from fulfilling our professional roles. For those times, employee assistance programs can provide a confidential and objective source of support. We need to have the courage and resolve to seek out such assistance when we find ourselves in times of need. Both for our own good, but also for the benefit of those with whom we work on a daily basis.

Carl Clayton used a self-assessment instrument in his presentation several years ago, similar to one that has been distributed to you. During his presentation, Clayton asked us to use a seven-point scale in which 1 was poor and 7 was excellent to rate our sense of satisfaction or fulfillment on each dimension. After completing our individual ratings, we were asked to draw a line connecting the ratings on adjacent spokes. As you study the shape of your results . . . Do you perceive your wheel to be somewhat
balanced and symmetrical? . . . which corresponds with a relatively smooth ride as you travel down the superhighway of your life. On the other hand, if there is severe imbalance among the seven dimensions, you might expect a bumpier ride. Experiencing imbalance among the four foundational dimensions (physical, social, mental, and spiritual, located across the bottom of the wheel) may inhibit our potential satisfaction in the financial, career, and/or family dimensions.

Tradeoffs are also an important factor to consider in balanced living. Some individuals (knowingly or unknowingly) sacrifice certain dimensions of their lives (at least in the short run) to place more emphasis on other dimensions. Graduate students often make sacrifices in the financial and family dimensions of their lives in the short run in order achieve long term career goals. Such tradeoffs are fine, so long as it is a conscious decision, and only for a short period of time. But if you are feeling dissatisfied or unfulfilled for some reason, you might want to examine the seven dimensions to determine if you are experiencing life balance issues that may need to be addressed.

As I mentioned earlier, each of us in our professional roles have unique opportunities to interact with professional colleagues at various levels and contribute to their development and success in various ways. Living a balanced life not only contributes to our own sense of success and fulfillment . . . but also allows each of us to Pay it Forward by influencing others through the ripple effect. Zig Ziglar has been quoted as saying “You can get what you want, if you help enough other people get what they want!” I hope that each of you has been challenged to seek and maintain balance among these seven dimensions in your life. I truly believe that doing so will enhance your potential for professional success and personal satisfaction in your life . . . and you in turn may have a similar effect on those around you back at home. If my comments have contributed in some small way to your success, then I will have truly have Paid it Forward and fulfilled my purpose here this morning!

Thank you for the opportunity to share these thoughts with you today. It is truly been an honor and a blessing to present the 2012 AAAE Distinguished Lecture. Best wishes for a successful conference! [Using American Sign Language, gestured “eye, love, you” to audience.]
Identification and Validation of Agricultural Hazardous Occupations Order Certification Program Instructor Criteria and Competencies

Shannon Snyder  
Purdue University  
Brian French  
Washington State University  
William Field  
Roger Tormoehlen  
Daniel Ess  
Purdue University

The USDA/NIFA has awarded funding to Land Grant Institutions to conduct and enhance the Hazardous Occupations Safety Training in Agriculture (HOSTA) program. The HOSTA program is designed to provide relevant educational opportunities in an effort to reduce the frequency and severity of farm-related injuries to all youth who work in agricultural production and to meet the current training requirements of the Agricultural Hazardous Occupations Order (AgHOs) for non-exempt youth. The Cooperative Extension Service and secondary school agricultural science and business programs are designated by the AgHOs as the only entities eligible to conduct and affirm completion of certification training. However, the law does not identify the minimum core competencies necessary for instructors and there are currently no evidence-based criteria to assess the preparedness of individuals who provide instruction to youth seeking AgHOs certification. One of the objectives of the current HOSTA project at Purdue University is to identify and validate minimum criteria and desired core competencies for agricultural safety instructors participating in the certification training required by the current Agricultural Hazardous Occupations Order (AgHOs) of 1968 as listed in Subpart E-1 of Part 1500 of Title 29 of the Code of Federal Regulations, an amendment to the Fair Labor Standards Act of 1938 (United States Department of Agriculture, 2010). This effort was designed to build upon the currently identified criteria specified in the law and attempt to validate an expanded set of

Keywords: Agricultural safety, Agricultural Hazardous Occupations Safety Training, AgHOs, Hazardous Occupations Safety Training in Agriculture, HOSTA, Instructor training, Farm safety for youth.

The United States Department of Agriculture’s (USDA) National Institute of Food and Agriculture (NIFA) has provided funding under the provisions of the Employment of Youth in Agriculture Program to develop and support the current Hazardous Occupations Safety Training in Agriculture (HOSTA) initiative (Employment of Youth in Agriculture, 2005). The HOSTA program provides relevant safety and health educational opportunities for youth engaged in agricultural production activities in an effort to reduce the rate of farm-related injuries to youth, especially youth less than 16 years of age. HOSTA program funds have been allocated on a competitive basis to Land Grant Institutions to enhance agricultural safety and health programming nationwide. One goal of the HOSTA project at Purdue University has been to identify and validate minimum criteria and desired core competencies for agricultural safety instructors participating in the certification training required by the current Agricultural Hazardous Occupations Order (AgHOs) of 1968 as listed in Subpart E-1 of Part 1500 of Title 29 of the Code of Federal Regulations, an amendment to the Fair Labor Standards Act of 1938 (United States Department of Agriculture, 2010). This effort was designed to build upon the currently identified criteria specified in the law and attempt to validate an expanded set of
evidence-based criteria and competencies that reflect changes in the training and experience of eligible instructional personnel, agricultural practices, and technology over the past 40 years. The effort would also contribute to enhancing the capacity of other agricultural and youth educators to provide effective agricultural safety and health instruction.

Recent, however, unsuccessful, proposed changes to the AgHOs held the potential to further limit youth participation in agricultural tasks on a for hire basis. Several AgHOs task areas would have been expanded to further clarify and restrict participation by both youth under 16 and those enrolled in supervised agricultural work experiences (United States Department of Labor, 2011a). The proposed changes would have also removed the current exemption that permits youth ages 14-15 years old to perform certain agricultural tasks for hire, provided they have completed an approved training course. These proposed changes were justified partially on the argument that current AgHOs training lacked instructional consistency (United States Department of Labor, 2011b). The necessity for instructors of these programs to possess minimum criteria and competencies was perceived as a gap in the effort to provide effective outcome based education and training to youth exposed to agricultural hazards.

Based on a review of literature, no evidence-based criteria were identified that could be used to assess the preparedness of individuals to provide instruction to youth seeking AgHOs certification. The only general criterion identified in the language of the AgHOs is that certification be authorized by a “Cooperative Extension Service agent” or conducted and signed by a “vocational agriculture teacher” (Part 570—Child labor regulations, orders, and statements of interpretation, 2010). The roles and preparation of these professionals have evolved substantially since the AgHOs originally identified these two groups of educators in 1968. These changes have resulted in individuals who are eligible to teach by position, but who possibly lack the necessary experience, criteria, skill sets, and knowledge to provide the desired levels of instruction.

The goal of the Purdue University instructor training component of the HOSTA program was to build upon the criteria that were specifically identified or implied by the current AgHOs and enhance them through an evidence-based process to more closely match the current curriculum needs and changing characteristics of available instructors. This work is situated at the intersection of validity theory and curriculum development theory. The authors relied on the practical approach of building a validity argument (e.g., Kane, 2006) based on evidence to support the content that is essential to this domain (Porter, 2002; 2006) with the forethought of how this information will be assessed and interpreted in practice while relying on the practical approaches to developing curriculum (e.g., Ornstein & Hunkins, 2004; Tanner & Tanner, 2006) that is useful without engaging in the debate on which approach is most appropriate. That debate is beyond the scope of the paper. However, the systematic approach used follows standard practice. What can be seen within the framework, for instance, in interviews with agricultural teacher educators as well as currently employed agricultural educators, was an indication that meeting the current criteria, especially with the changing roles and educational experience of most extension educators and agricultural education teachers, no longer indicates that an individual was in possession of the desired competencies to effectively teach youth how to safely work in agricultural production. Consequently, the need to develop minimum criteria and core competencies for instructors was identified.

These criteria and competencies could then serve as a guide to develop, pilot test, and implement resources and training strategies that would improve the quality of both AgHOs certification specifically and agricultural safety and health instruction in general nationwide. Findings would also be helpful in providing evidence-based guidance for revisions to the current AgHOs in order to more closely reflect changing public expectations as well as current farm-related injury data involving youth.

Statement of the Problem

The current requirements for instructors of certification programs, as prescribed by the
AgHOs of 1968, are no longer adequate due to changing demographics, backgrounds, training and experience levels, along with changes in agricultural technology and practices. There is a need for evidence based and documentable selection criteria and minimum core competencies for these instructors to ensure youth receive training that is consistent with the AgHOs requirements and that adequately addresses the most significant hazards associated with current agricultural production processes and practices. Unlike most youth directed instruction in agriculture, this training is designed specifically to reduce the frequency of injuries and fatalities to this population. The consequences of ineffective instruction can be much more critical than outcomes in other areas due to poor instruction.

Research Questions

This research addressed the question of identifying the general criteria, including cognitive and behavioral competencies, and prerequisites desired and required of instructors of AgHOs certification programs to ensure that the instruction prepares youth to perform tasks especially hazardous in agriculture. In addition, the strategies that can be used to reliably assess these competencies and/or prerequisites were validated through the review process involving multiple data points and persons with expertise in the appropriate areas.

Materials and Methods

The authors reviewed past and currently available instructional resources used in AgHOs certification programs and general agricultural safety and health curricula used across the country to develop an initial framework of the minimum criteria and desired core competencies. Nearly all of these materials were based upon the original directives found in the language of the AgHOs (Part 570—Child labor regulations, orders, and statements of interpretation, 2010) that specified content from the original 4-H tractor and machinery manuals 1-4 that predated the AgHOs. These curricula have matured over time and the most recent include the National Safe Tractor and Machinery Operator Program (NSTMOP, 2006) and Gearing Up for Safety: Agricultural Production Safety Training for Youth (Gearing Up for Safety, 2003). Using the Gearing Up for Safety list of minimum desired core competencies for youth validated by Ortega (2011) as a guide, a list of corresponding instructor competencies was composed. This list was reviewed internally by a panel of experts comprised of the National HOSTA Advisory Committee.

The Questionnaire

An electronic questionnaire was developed from the list of identified instructor competencies that was again reviewed by the National HOSTA Advisory Committee, and pilot tested with a convenience sample of current instructors of AgHOs certification courses. The revised questionnaire was imported into the Qualtrics web-based survey software to facilitate electronic distribution. The questionnaire was password-protected with the password sent to potential respondents via email. Responses to the questionnaire would remain anonymous; however, it was necessary to isolate non-respondents in order to send reminders per the Tailored Design Method (Dillman, 2000; Dillman, 2007). Thus, potential respondents were assigned a randomly generated personal identification number. The questionnaire protocol required this number following the password request. The electronic questionnaire was divided into two sections: content-related items and demographic information. Included in the content-related section were 51 criteria or competency items. Respondents ranked each item on a five-point Likert scale according to their perception of importance of the criteria or competency for qualified instructors. The demographic section included 24 questions pertaining to respondents’ teaching experience, occupation, education, and curriculum use.

Data Collection Method

The procedure for gathering data followed Dillman’s Tailored Design Method (2000, 2007). The questionnaire was distributed via a
link included in an email message, as was respondents’ passwords and personal identification numbers (PIN). Data was summarized using mean, median, mode, range, and standard deviation for each criterion or competency. Calculations were performed using Microsoft Excel.

Population Surveyed

The population surveyed was identified from the NSTMOP Community Lead Instructors list and the Gearing Up for Safety Instructor Database. This population of 791 individuals, who had participated in AgHOs instructor training and self identified as AgHOs instructors, was selected as a source for potential respondents due to the belief they had the best knowledge of what it takes to be an effective instructor. Administrators of each database granted approval to use the contact information, and Information Technology (IT) personnel generated and assigned random numbers to each entry. The numbers would be used by IT personnel to determine non-response.

The NSTMOP database contained a total of 524 entries. Removal of entries due to duplications and absent email addresses resulted in a total of 426 potential respondents. The Gearing Up for Safety Instructors database contained a total of 267 entries. Removal of entries for the same reasons resulted in 257 total potential respondents. This resulted in 683 total potential respondents with email addresses prior to the sending of any data collection materials. The final useable sample was 507, representing 46 states, after controlling for invalid email addresses.

By the culmination of the study, four email messages requesting data had been sent to each potential respondent. The resulting response rate was 49% (N = 249).

Non-response error was controlled by randomly selecting ten percent of non-respondents using their identification number. An attempt to contact each of these instructors was made by phone. If contact was made, the instructor was asked to complete the questionnaire orally with the response recorded in a separate electronic database. Through repeated contacts over 8 weeks, only five responses were achieved. This was an insufficient amount to conduct statistical tests with adequate statistical power to determine the extent of non-response bias.

Validation

A panel of 11 experts in occupational and educational fields pertaining to agricultural safety was assembled to validate data gathered. The perspectives presented by panel members were directed toward the development of an agricultural safety instructor curriculum. This was consistent with prior work of Kingman, Yoder, Hodge, Ortega, & Field (2005) as an approach to developing a curriculum. The panel was presented with the criterion and competency data collected from the 249 respondents in summary form. Competency-related feedback generated by the panel was gathered as written perspectives of time and emphasis ranking for each competency. Criterion-related feedback was collected in the form of yes/no responses to the question of whether each criterion should be included as a component of an AgHOs instructor curriculum.

Limitations

The population referred to in this study was limited to instructors of agricultural safety programs who had received training by Pennsylvania State University or Purdue University as a part of the HOSTA program. Perspectives from agricultural safety instructors not included in these two groups hold the potential to influence the results reported here.

Data collection for the study was electronic-based only, which limited the results to those respondents who are users of electronic-based media including email. Responses from instructors who do not use electronic-based media were not determined.

Results and Discussion

Criteria Ranking by Survey Respondents

Criteria were defined as the minimal qualifications for persons seeking to provide
instruction to youth participating in agricultural safety programs designed to meet or exceed AgHOs requirements. There were 15 criteria identified in the review process that were in the questionnaire. One open ended question sought input from participants as to the minimum age believed necessary for AgHOs instructors. Descriptive statistics for the perceived level of importance of criteria as ranked by respondents are shown in descending order in Table 1. Responses were ranked on a five-point Likert scale with 5 representing most important.

### Table 1

<table>
<thead>
<tr>
<th>Instructors of agricultural tractor and machinery safety programs should:</th>
<th>M</th>
<th>SD</th>
<th>Range</th>
<th>Mode</th>
<th>Median</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Be at least 18 years old</td>
<td>4.64</td>
<td>0.64</td>
<td>3-5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>2. Demonstrate mastery of the primary language necessary for instruction</td>
<td>4.47</td>
<td>0.76</td>
<td>1-5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>3. Possess a valid driver’s license</td>
<td>4.35</td>
<td>0.97</td>
<td>1-5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>4. Have received formal safety training through classes, seminars, or training opportunities</td>
<td>4.22</td>
<td>0.90</td>
<td>1-5</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>5. Have passed (minimum 70 percent correct) a written test that addresses the basic requirements of the AgHOs (Agricultural Hazardous Occupations Order)</td>
<td>4.05</td>
<td>0.99</td>
<td>1-5</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>6. Submit to a criminal background check</td>
<td>3.97</td>
<td>1.22</td>
<td>1-5</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>7. Possess at least 3 years of agricultural equipment operation experience</td>
<td>3.78</td>
<td>1.12</td>
<td>1-5</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>8. Have first aid training</td>
<td>3.43</td>
<td>1.10</td>
<td>1-5</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>9. Have a minimum of 3 years agricultural production experience</td>
<td>3.41</td>
<td>1.18</td>
<td>1-5</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>10. Carry professional liability insurance</td>
<td>3.30</td>
<td>1.33</td>
<td>1-5</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>11. Be a secondary school agricultural education instructor</td>
<td>2.81</td>
<td>1.26</td>
<td>1-5</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>12. Have at least 3 years teaching experience at any level</td>
<td>2.76</td>
<td>1.25</td>
<td>1-5</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>13. Possess a secondary school teaching certificate</td>
<td>2.74</td>
<td>1.38</td>
<td>1-5</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>14. Be an extension educator/agent</td>
<td>2.71</td>
<td>1.18</td>
<td>1-5</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>15. Possess FEMA (Federal Emergency Management Agency) emergency preparedness certification</td>
<td>1.99</td>
<td>1.03</td>
<td>1-5</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>16. What should be the minimum age for instructors of agricultural safety programs?</td>
<td>21.32</td>
<td>2.36</td>
<td>14-30</td>
<td>21</td>
<td>21</td>
</tr>
</tbody>
</table>

**Note.** Scale: $M = 1.00-1.50 = $Low Importance, $M = 1.51-2.50 = $Moderately Low Importance, $M = 2.51-3.50 = $Moderate Importance, $M = 3.51-4.50 = $Moderately High Importance, $M = 4.51-5.00 = $High Importance.

Respondents provided a mean ranking of all criteria between *moderately low importance* ($M = 1.51-2.50$) and *high importance* ($M = 4.51-5.00$). According to respondents’ perceptions, being at least 18 years old was the only *high importance* ($M = 4.51-5.00$) criteria ($M = 4.64; SD = 0.64$).

Those criteria that received a mean ranking by respondents as *moderately high importance* ($M = 3.51-4.50$) included: “demonstrate a mastery of the primary language necessary for instruction,” “possess a valid driver’s license,” “have received formal safety training through classes, seminars, or training opportunities,” “have passed (minimum 70 percent correct) a written test that addresses the basic requirements of the AgHOs,” “submit to a criminal background check,” and “possess at least 3 years of agricultural equipment operation experience.”

Seven criteria received a mean ranking by respondents as *moderate importance* ($M = 2.51-3.50$) including: “have first aid training,” “have a
minimum of 3 years agricultural production experience,” “carry professional liability insurance,” “be a secondary school agricultural education instructor,” “have at least 3 years teaching experience at any level,” “possess a secondary school teaching certificate,” and “be an extension educator/agent.”

Although no criteria received a mean ranking of low importance \((M = 1.00-1.50)\), one criterion, “possess FEMA (Federal Emergency Management Agency) emergency preparedness certification,” received a mean ranking of moderately low importance \((M = 1.51-2.5)\).

Data gathered by the electronic questionnaire also indicated that instructors should be at least 18 years old \((M = 4.64, SD = 0.64)\). When respondents were asked to specifically identify the minimum age necessary for effective instruction of agricultural safety, the mean response was 21 years \((M = 21.21, SD = 2.73)\). Under the current provisions of the AgHOs, it is unlikely to have an individual under the age of 21 meet the criteria of being either an Extension educator or a vocational agriculture teacher. However, findings suggest that respondents may see a role for those 18-21 to assist in program delivery, assisting a lead instructor.

Criteria ranked of higher importance tended to also have a lower standard deviation, indicating less variability in responses and more agreement on high importance. The lowest ranked criterion, “possess FEMA (Federal Emergency Management Agency) emergency preparedness certification,” had a lower standard deviation than did other criteria ranked with a lower importance.

**Criteria Validation**

The assessment of the results from the expert panel members is included as Table 2. These findings were based upon preliminary written rankings and led discussions.

**Table 2**

*Ranking of Criteria to be Included in an AgHOs Safety Certification Instructor Curriculum by an Expert Panel (N = 11)*

<table>
<thead>
<tr>
<th>Criteria</th>
<th>(M)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demonstrate mastery of the primary language necessary for instruction</td>
<td>1.00</td>
</tr>
<tr>
<td>Submit to a criminal background check</td>
<td>1.00</td>
</tr>
<tr>
<td>Possess a valid Driver’s License</td>
<td>0.91</td>
</tr>
<tr>
<td>Have received formal safety training through classes, seminars, or training opportunities</td>
<td>0.82</td>
</tr>
<tr>
<td>i. Possess at least 3 years of agricultural equipment operation experience</td>
<td>0.82</td>
</tr>
<tr>
<td>Have first aid training</td>
<td>0.73</td>
</tr>
<tr>
<td>Be at least 18 years old</td>
<td>0.64</td>
</tr>
<tr>
<td>Have a minimum of 3 years agricultural production experience</td>
<td>0.27</td>
</tr>
<tr>
<td>Have passed (minimum 70 percent correct) a written test that addresses the basic requirements of the AgHOs (Agricultural Hazardous Occupations Order)</td>
<td>0.18</td>
</tr>
<tr>
<td>Carry professional liability insurance</td>
<td>0.09</td>
</tr>
<tr>
<td>Be a secondary school agricultural education instructor</td>
<td>0.09</td>
</tr>
<tr>
<td>Have at least 3 years teaching experience at any level</td>
<td>0.00</td>
</tr>
<tr>
<td>Possess a secondary school teaching certificate</td>
<td>0.00</td>
</tr>
<tr>
<td>Be an extension educator/agent</td>
<td>0.00</td>
</tr>
<tr>
<td>Possess FEMA (Federal Emergency Management Agency) emergency preparedness certification</td>
<td>0.00</td>
</tr>
</tbody>
</table>

*Note.* Scale: 1 = Yes, 0 = No

Data gathered from the panel indicated strong agreement \((M > 0.75)\) in terms of which criteria an instructor should meet. Those criteria included: “demonstrate mastery of the primary language necessary for instruction,” “possess a valid driver’s license,” “have received formal safety training through classes, seminars, or training opportunities,” “submit to a criminal background check,” and “possess a secondary school teaching certificate.”
background check,” and “possess at least three years of agricultural equipment operation experience.”

Panel members drew from their personal and professional experience to set the cut score for inclusion of criteria in an instructor curriculum at 0.5. The criterion ranked above the cut score, but not strongly agreed upon by the panel members was: “be at least 18 years old.” The rationale that influenced this ranking was that many panel members believed 21 years old to be a more appropriate minimum age for instructors of agricultural safety programs.

Panel members unanimously ranked four criteria to not be included \( (M = 0.00) \). The criteria not considered relevant were: “have at least three years teaching experience at any level,” “possess a secondary school teaching certificate,” “be an extension educator/agent” (which is inconsistent with the current provisions of the AgHOs), and “possess FEMA (Federal Emergency Management Agency) emergency preparedness certification.”

Eight criteria that had been ranked of Moderately High Importance \( (M = 3.51-4.50) \) to Moderately Low Importance \( (M = 1.51-2.50) \) by respondents to the questionnaire were determined to be of low importance for two primary reasons. 1. Some criteria, for example: “instructors of agricultural tractor and machinery safety programs should have passed (minimum 70 percent correct) a written test that addresses the basic requirements of the AgHOs,” would not facilitate sustainability of the program since oversight to periodically monitor, maintain, update, administer, and/or grade the tests would be necessary. 2. Other criteria, such as: “instructors of agricultural tractor and machinery safety programs should possess a secondary school teaching certificate,” were determined by the panel to present undue occupation-related restrictions to otherwise qualified instructors.

Criteria that met this rationale were found, in many cases, to be addressed by cooperating agencies such as 4-H or school systems that sponsor agricultural safety training for youth.

Indications based upon verbal feedback from the panel determined that AgHOs safety certification instructor programs should be designed as self-sustaining to prepare potential instructors with at least the minimum required knowledge and skills necessary to teach agricultural safety to youth. As such, it was the panel’s position that only those criteria that were not addressed by other related, sponsoring, or cooperating entities should be included.

**Competency Ranking by Survey Respondents**

Competencies were defined as knowledge and skills acquired as a result of training, experience, or education. Included in the electronic questionnaire were 36 competencies that current instructors were asked to rank in terms of importance for mastery by instructors. The perceived levels of importance of competencies are shown in descending order in Table 3, ranked on a five-point Likert scale.
Table 3
Distribution of Current AgHOs Safety Instructors’ Perception of Importance of Selected Competencies (n = 249) with Ranking of Instructional Time Allocation to Competencies by Expert Panel (N = 11) in parentheses

<table>
<thead>
<tr>
<th>Rank</th>
<th>Instructors should possess knowledge in the following areas:</th>
<th>M</th>
<th>SD</th>
<th>Range</th>
<th>Mode</th>
<th>Median</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. (34)</td>
<td>Effective communication with the intended audience</td>
<td>4.57 (1.73)</td>
<td>0.63 (1.27)</td>
<td>2-5 (1-5)</td>
<td>5 (1)</td>
<td>5 (1)</td>
</tr>
<tr>
<td>2. (1)</td>
<td>Identification and explanation of the function and location of safety features and devices found on tractors</td>
<td>4.52 (4.55)</td>
<td>0.67 (0.69)</td>
<td>2-5 (3-5)</td>
<td>5 (5)</td>
<td>5 (5)</td>
</tr>
<tr>
<td>3. (3)</td>
<td>Basic operating principles of PTO powered agricultural machinery</td>
<td>4.51 (4.27)</td>
<td>0.76 (1.01)</td>
<td>1-5 (2-5)</td>
<td>5 (5)</td>
<td>5 (5)</td>
</tr>
<tr>
<td>4. (2)</td>
<td>Safe operation procedures relative to tractor component basics</td>
<td>4.50 (4.55)</td>
<td>0.75 (0.82)</td>
<td>1-5 (3-5)</td>
<td>5 (5)</td>
<td>5 (5)</td>
</tr>
<tr>
<td>5. (5)</td>
<td>Identification of basic tractor components</td>
<td>4.45 (4.09)</td>
<td>0.74 (0.94)</td>
<td>2-5 (3-5)</td>
<td>5 (5)</td>
<td>5 (4)</td>
</tr>
<tr>
<td>6. (6)</td>
<td>General awareness of agricultural hazards</td>
<td>4.44 (3.91)</td>
<td>0.77 (0.93)</td>
<td>1-5 (3-5)</td>
<td>5 (4)</td>
<td>5 (4)</td>
</tr>
<tr>
<td>7. (7)</td>
<td>Proper use of personal protective equipment</td>
<td>4.37 (3.82)</td>
<td>0.87 (0.97)</td>
<td>1-5 (3-5)</td>
<td>5 (3)</td>
<td>5 (4)</td>
</tr>
<tr>
<td>8. (8)</td>
<td>Identification and explanation of the function and location of basic integral components found on powered agricultural machines</td>
<td>4.34 (3.64)</td>
<td>0.77 (0.81)</td>
<td>2-5 (3-5)</td>
<td>5 (3)</td>
<td>5 (3)</td>
</tr>
<tr>
<td>9. (4)</td>
<td>Safe operation of powered agricultural machinery</td>
<td>4.32 (4.18)</td>
<td>0.86 (0.87)</td>
<td>1-5 (3-5)</td>
<td>5 (5)</td>
<td>5 (4)</td>
</tr>
<tr>
<td>10. (30)</td>
<td>Demonstrated ability to access materials and facilities required for successful safety training programs</td>
<td>4.32 (2.09)</td>
<td>0.70 (1.04)</td>
<td>1-5 (1-4)</td>
<td>4 (1)</td>
<td>4 (2)</td>
</tr>
<tr>
<td>11. (9)</td>
<td>Safe operation of a tractor through a structured course</td>
<td>4.31 (3.55)</td>
<td>0.88 (1.21)</td>
<td>1-5 (2-5)</td>
<td>5 (5)</td>
<td>5 (4)</td>
</tr>
<tr>
<td>12. (11)</td>
<td>Safe practices when working with hydraulics</td>
<td>4.25 (3.45)</td>
<td>0.81 (1.36)</td>
<td>1-5 (1-5)</td>
<td>5 (5)</td>
<td>4 (3)</td>
</tr>
<tr>
<td>13. (17)</td>
<td>Laws and regulations that apply to youth working in agricultural workplaces</td>
<td>4.18 (2.91)</td>
<td>0.83 (1.51)</td>
<td>1-5 (1-5)</td>
<td>4 (3)</td>
<td>4 (3)</td>
</tr>
<tr>
<td>14. (20)</td>
<td>Meanings associated with standard safety colors</td>
<td>4.17 (2.73)</td>
<td>0.86 (1.01)</td>
<td>1-5 (1-4)</td>
<td>5 (3)</td>
<td>4 (3)</td>
</tr>
<tr>
<td>15. (31)</td>
<td>Access to knowledgeable individuals within the local community</td>
<td>4.15 (2.09)</td>
<td>0.73 (0.94)</td>
<td>1-5 (1-4)</td>
<td>4 (2)</td>
<td>4 (2)</td>
</tr>
<tr>
<td>16. (14)</td>
<td>Safe practices for operating ATVs</td>
<td>4.10 (3.09)</td>
<td>0.97 (1.22)</td>
<td>1-5 (1-5)</td>
<td>5 (3)</td>
<td>4 (3)</td>
</tr>
</tbody>
</table>

(Table 3 continues)
<table>
<thead>
<tr>
<th>Rank</th>
<th>Knowledge Area</th>
<th>M</th>
<th>SD</th>
<th>Range</th>
<th>Mode</th>
<th>Median</th>
</tr>
</thead>
<tbody>
<tr>
<td>17.</td>
<td>Required procedures for entering agricultural confined spaces such as grain bins, silos, etc.</td>
<td>4.08</td>
<td>1.04</td>
<td>1-5</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>18.</td>
<td>Locating appropriate safety resources</td>
<td>4.07</td>
<td>0.93</td>
<td>1-5</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>19.</td>
<td>Fire safety and suppression</td>
<td>4.05</td>
<td>0.96</td>
<td>1-5</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>20.</td>
<td>Agricultural practices and structures that could yield or contain toxic gases and/or entrapment in a toxic environment</td>
<td>4.02</td>
<td>0.97</td>
<td>1-5</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>21.</td>
<td>Demonstrated record keeping skills</td>
<td>3.98</td>
<td>0.86</td>
<td>1-5</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>22.</td>
<td>Safe operating procedures for skid steer loaders</td>
<td>3.95</td>
<td>1.05</td>
<td>1-5</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>23.</td>
<td>Electrical safety</td>
<td>3.95</td>
<td>1.02</td>
<td>1-5</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>24.</td>
<td>General agricultural practices that focus on various agricultural machines, methods, practices, procedures, crops, livestock, and other related agricultural areas</td>
<td>3.91</td>
<td>0.89</td>
<td>1-5</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>25.</td>
<td>Safe animal handling techniques</td>
<td>3.88</td>
<td>1.08</td>
<td>1-5</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>26.</td>
<td>Animal behavior characteristics</td>
<td>3.85</td>
<td>1.09</td>
<td>1-5</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>27.</td>
<td>Safe operation of farm vehicles with the primary purpose of carrying passengers</td>
<td>3.73</td>
<td>1.18</td>
<td>1-5</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>28.</td>
<td>Up to date technologies (computers, DVDs, webinars, online forums, etc.) used for safety instruction</td>
<td>3.72</td>
<td>1.01</td>
<td>1-5</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>29.</td>
<td>Procedures to safely handle restricted use agricultural chemicals</td>
<td>3.68</td>
<td>1.18</td>
<td>1-5</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>30.</td>
<td>Procedures for safely handling anhydrous ammonia (NH₃)</td>
<td>3.68</td>
<td>1.15</td>
<td>1-5</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>31.</td>
<td>Statistics that describe the frequency and severity of injuries in agricultural workplaces</td>
<td>3.51</td>
<td>0.95</td>
<td>1-5</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>32.</td>
<td>Safe procedures for operation of forklifts</td>
<td>3.42</td>
<td>1.15</td>
<td>1-5</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>33.</td>
<td>Procedures for safely working on ladders or scaffolding at heights greater than 20 feet</td>
<td>3.39</td>
<td>1.28</td>
<td>1-5</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>34.</td>
<td>Safe procedures for operation of earth moving equipment</td>
<td>3.38</td>
<td>1.24</td>
<td>1-5</td>
<td>4</td>
<td>4</td>
</tr>
</tbody>
</table>

(Table 3 continues)
Respondents ranked all competencies at least moderately important. Three competencies were perceived by current instructors of AgHOs certification programs as being of high importance ($M = 4.51-5.00$): “effective communication with the intended audience,” “identification and explanation of the function and location of safety features and devices found on tractors,” and “basic operating principles of PTO powered agricultural machinery.”

The majority of competencies (75%) presented in the questionnaire were perceived by respondents as being of moderately high importance ($M = 3.51-4.50$). This reflected that the competencies identified in the review of current resources continue to be important.

The remaining five competencies included in the questionnaire were perceived by respondents to be of moderate importance ($M = 2.51-3.50$): “safe procedures for operation of forklifts,” “procedures for working on ladders or scaffolding at heights greater than 20 feet,” “safe procedures for operation of earth moving equipment,” “basic adolescent/youth development,” and “safe practices used when handling blasting agents.”

**Competencies Validation**

Validation of instructor competencies was accomplished by the expert panel that allocated instructional time (in parentheses in Table 3) to each competency in a hypothetical AgHOs safety certification instructor curriculum. Data gathered from responses to the electronic survey of instructors resulted in a ranked order of competencies in terms of perceived importance. This ranked list of competencies was presented to expert panel members in order to provide a reference for use when allocating instructional time to each competency. Importance data was omitted in an attempt to avoid biasing the time allocation rankings (which also used a five-point Likert scale) of panel members.

The panel identified two competencies as requiring a large amount of time or emphasis ($M = 4.51 - 5.00$), as noted by the data included in parentheses in Table 3. These two areas were: “identification and explanation of the function and location of safety features and devices found on tractors” ($M = 4.55$, $SD = 0.69$) and “safe operation procedures relative to tractor component basics” ($M = 4.55$, $SD = 0.82$).

The competency “safe practices used when handling blasting agents” ($M = 1.50$, $SD = 1.27$) received the lowest mean ranking in terms of time or emphasis allocated to the subject by the expert panel. The panel reported that even though this activity is considered illegal under the provisions of the AgHOs, youth should be made aware of what tasks they cannot perform.

**Conclusions**

**Conclusions Concerning Questionnaire Response for Minimum Criteria**

Criteria included in the questionnaire were isolated as a result of a review of literature related to past and current AgHOs curricula and available agricultural safety and health resources, input from a panel of experts, and results from a pilot survey of current instructors of the Gearing Up for Safety curriculum. The resulting 15 criteria were ranked in terms of level of importance by 249 current agricultural safety and health instructors via an electronic survey.
Age of the instructor, along with mastery of the primary language necessary for instruction, possession of a valid driver’s license, and completion of formal safety training were perceived as of greatest importance. The instructors’ occupation appeared to be of lesser concern to questionnaire respondents. The criterion rated least important by respondents was that instructors obtain FEMA training and certification.

Conclusions Concerning Expert Panel Validation of Minimum Criteria

Validation of the criteria survey responses was conducted by an expert panel that determined the minimum mean “yes”/“no” score necessary to rate significance for the criteria. The minimum mean value was set at 0.50. Based on this determination, criteria numbers 1-7 listed in Table 2 were recommended for inclusion in future selection processes for AgHos instructors.

Conclusions Concerning Questionnaire Response for Minimum Competencies

Based on a review of literature, applicable laws, related curricula, and feedback from experts in the field, a list of minimum core competencies necessary for mastery by instructors of AgHos safety certification programs was generated and validated by a panel of experts as the recommended building blocks for instructor selection and training. The instructors’ ranking of the perceived level of importance of each competency guided the expert panel in determining the amount of time that should be allocated to each core competency.

Although the majority of competencies (86%) included in the questionnaire received rankings of at least moderately high importance, competencies that dealt directly with tractor and machinery safety were ranked among the highest by respondents. Examples included: “identification and explanation of the function and location of basic integral components found on powered agricultural machines,” “safe operation of powered agricultural machinery,” and “safe operation of a tractor through a structured course.” This appears to reflect both the historical focus of AgHos training and the causes of the most severe injuries to youth employed in agriculture.

Conclusions Concerning Expert Panel Validation of Minimum Competencies

The distribution of time or emphasis for the competencies tended to resemble the importance rankings that were provided by electronic questionnaire respondents. Of the competencies included in the electronic questionnaire, “effectively communicate with the intended audience” was ranked by respondents as the most important. After discussion, the expert panel determined that this qualification was more in accordance with the definition of a criterion than a competency. In addition, experts found it to be redundant with respect to the criterion “mastery of the primary language necessary for instruction,” and therefore combined the two as a single criterion.

Many of the competencies ranked as requiring the greatest time allowance pertained to safe operation of agricultural tractors and machinery. Due to the fact that one of the primary purposes of AgHos safety certification programs is to prepare youth ages 14-15 years old to safely operate agricultural tractors and machines for hire, the ranking was no surprise. Consequently, a strong emphasis of AgHos safety certification instructor training should be placed on preparation of these individuals in tractor and machine safety, component identification, and operation knowledge.

Noteworthy is the moderately high level of emphasis placed on making instructors aware of their own and their students’ personal safety. This is supported by panel members’ ranking that “general awareness of agricultural hazards” and “proper use of personal protective equipment” should be allocated moderately large amounts of time or emphasis in an instructor curriculum.

Some competencies were associated with tasks that were expressly prohibited for youth in
the current AgHOs. These included items such as: “safe operation of farm vehicles with the primary purpose of carrying passengers,” “required procedures for entering confined spaces such as grain bins, silos, etc.,” and “safe practices used when handling blasting agents.” Initially, the panel of experts determined that these competencies were inappropriate for inclusion in an instructor curriculum since they are expressly identified as illegal for youth to perform under the age of 16. However, it was concluded that inclusion would result in an instructor possessing necessary knowledge of prohibited tasks. Thus, he or she could instruct youth of specific reasons why the tasks are hazardous and reiterate why youth should not perform them.

Discussion with the expert panel concluded that there would be insufficient time to address all potential ways that youth could be injured. Members recommended that the provisions of the AgHOs be revisited to initiate revisions that reflect newer curriculum material, current farm-related injury data, changes in agricultural practices and societal expectations, and findings of this study. Rather than responding to a small number of highly publicized agricultural-related injuries when proposing revisions to the current AgHOs, utilization of the criteria and competencies that have now been identified and validated would present a stronger, evidence-based framework for revisions.

Summary

The process used to identify and validate the minimum core criteria and competencies for instructors of certification programs under the provisions of the current AgHOs led to a list of specific outcomes for use in future curriculum development for instructors of AgHOs certification programs. Findings could be used to develop and pilot test targeted curricula that could be delivered via multiple formats, including face-to-face and online media. The process also provides a basis for assessing the readiness of potential instructors in an objective manner.

Most of the instructor criteria and competencies were consistent with general expectations reflected in currently used curricula, with several major exceptions. The low importance of being an Extension educator or agricultural (vocational) educator as a prerequisite indicated by respondents was surprising. This finding is inconsistent with the current requirements of the AgHOs, and may reflect expectations for persons in these positions that have changed dramatically over the past 40 years. Regardless, the findings suggest the restrictions should be re-evaluated in light of current skills and knowledge levels of these two groups.

One area of inconsistency between the surveyed AgHOs instructors and the expert panel was over the issue of testing and instructor certification. The current instructors reported that testing was of high importance; whereas the expert panel concluded that it was largely unneeded. This issue should be explored further. Regardless of current efforts to revise the AgHOs, the need to provide relevant instruction for those teaching agricultural safety and health competencies will remain. The greatest need for adequately prepared instructors will be for that population of youth who remain exempt from the current AgHOs provisions—the children of farm owners and operators. Any future consideration to the design of instructor training should include components that address reaching this underserved population.

Recommendations for Future Research

A greater understanding of the competencies and criteria most necessary for a successful agricultural safety education program could be from research efforts directed at employers of youth in agriculture. This population could provide a perspective of the jobs being assigned to youth, the dangers inherent to their operations, and the potential strategies to mitigate those risks.

An additional source of information that would better illustrate the balance between necessary competencies and criteria and those that would be best learned and utilized by students would be to seek feedback from youth who currently work in agriculture. These youth could identify the actual tasks being performed, the perceived need for instruction, and the characteristics of safety instructors that they believe to be of greatest importance in communicating safety and health information.
References


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Investigating the Effects of a Math-Enhanced Agricultural Teaching Methods Course

Christopher T. Stripling
University of Tennessee
T. Grady Roberts
University of Florida

Numerous calls have been made for agricultural education to support core academic subject matter including mathematics. Previous research has shown that the incorporation of mathematics content into a teaching methods course had a positive effect on preservice teachers’ mathematics content knowledge. The purpose of this study was to investigate the effects of a math-enhanced agricultural education teaching methods course on preservice agricultural education teachers’ mathematics ability, personal mathematics efficacy, mathematics teaching efficacy, and personal teaching efficacy. Results indicated that preservice teachers’ mathematics ability increased after the math-enhanced teaching methods course. Interestingly, personal mathematics efficacy decreased while mathematics teaching efficacy and personal teaching efficacy increased slightly after the math-enhanced teaching methods course. Based on the results of this study, peer-teaching that utilizes the seven components of a math-enhanced lesson may be an appropriate means to improve the mathematics ability of preservice agricultural education teachers.

Keywords: mathematics; math; preservice teachers; self-efficacy; teaching methods; teacher education

Increasing the mathematics proficiency of American students continues to be a top priority (National Commission on Mathematics and Science Teaching for the 21st century, 2000; National Research Council, 2001, 2007, 2011) almost thirty years after the National Commission of Excellence in Education (1983) released A Nation at Risk: The Imperative for Educational Reform. The National Commission of Excellence in Education called for additional instructional time, an increase in graduation rates, higher academic standards, and better-quality teacher education programs (Vinovskis, 2009). However, a plethora of recent research has shown that U.S. students are not proficient in mathematics (National Center for Educational Statistics, 2000a, 2000b, 2004, 2009a, 2009b, 2010, 2011). Likewise, the lack of mathematics proficiency among Florida students is well recognized, and in 2010, 56% of Florida 10th graders experienced little to partial success in mathematics (Florida Department of Education, 2010). In addition, the Michigan State University Center for Research in Mathematics and Science Education (2010) stated that preservice teachers are ill-prepared to teach a rigorous mathematics curriculum and that teacher education should provide training in mathematics and the methods of teaching mathematics. Therefore, the Michigan State University Center for Research in Mathematics and Science Education (2010) called for the U.S. educational system to “break the vicious cycle in which we find ourselves” (p. 3), where elementary and secondary teachers that are not proficient in mathematics produce students that are not proficient in mathematics, who then become teachers themselves and lack the necessary content knowledge to effectively teach mathematics. Consistent with the Michigan State University Center for Research in Mathematics and Science Education, Stripling and Roberts (2012a) found that Florida preservice agricultural education teachers were not proficient in mathematics standards within the agricultural curricula and are therefore ill-prepared to teach mathematics found naturally within the secondary agricultural education curricula.

Based on the aforementioned findings and recommendations, this study will seek to improve the mathematics ability of Florida preservice agricultural education teachers by incorporat-
ing the seven components of a math enhanced lesson (Stone, Alfeld, Pearson, Lewis, & Jensen, 2006) into the agricultural education teaching methods course at the University of Florida. In addition, this study will investigate the effects that a math-enhanced agricultural education teaching methods (MEAETM) course will have on personal mathematics efficacy, mathematics teaching efficacy, and personal teaching efficacy. Moreover, this study will contribute to priority 3 (sufficient scientific and professional workforce that addresses the challenges of the 21st century) and priority 5 (efficient and effective agricultural education programs) of the American Association for Agricultural Education’s national research agenda (Doerfert, 2011).

Theoretical Framework/Literature Review

The theoretical framework for this study was Bandura’s (1986) social cognitive theory. According to Bandura, social cognitive theory explains cognitive changes or learning over a lifetime and emphasizes that most cognitive skills are socially cultivated. In addition, Bandura purported that human thought and behavior are influenced by direct and observational experiences and physiological factors. Therefore, human behavior is influenced by personal experiences and are “retained in neural codes, rather than being provided ready-made by inborn programming” (Bandura, 1986, p. 22). With that in mind, “social cognitive theory encompasses a large set of factors that operate as regulators and motivators of established cognitive, social, and behavioral skills” (Bandura, 1997, p. 35). Thus, people are neither driven by inner forces nor automatically shaped and controlled by external stimuli. Rather, human functioning is explained in terms of a model of triadic reciprocity in which behavior, cognitive and other personal factors, and environmental events all operate as interacting determinants of each other. (Bandura, 1986, p. 18)

Bandura also stated that the interacting determinants (behavior, internal personal factors, and the external environment) influence each other bidirectionally, but their influences are not equal. Operationalized for this study, behavior is the teaching of contextualized mathematics, external environment is the teacher education program, and personal factors are self-efficacy and mathematics ability (Figure 1).

![Figure 1. Triadic reciprocity model. Adapted from Bandura (1986).](image-url)
Behavior – Teaching Contextualized Mathematics

In the context of this study, teaching contextualized mathematics in the teaching methods course is considered a behavior that is influenced bidirectionally by personal and environmental determinants. For example, teaching agriculture was influenced by the National Research Council’s (1988) call to emphasize academic skills through an integrated curricula and to become more than a vocational discipline, which influenced agricultural instruction in secondary and postsecondary settings (Phipps, Osborne, Dyer, & Ball, 2008). Previous research has indicated that preservice teachers are ill-prepared and lack sufficient mathematics content knowledge to teach mathematical concepts (Frykholm, 2000; Fuller, 1996; Goulding, Rowland, & Barber, 2002; Michigan State University Center for Research in Mathematics and Science Education, 2010; Miller & Gliem, 1996; Stacey, Helme, Steinle, Baturo, Irwin, & Bana, 2001; Stoddart, Connell, Stofflett, & Peck, 1993; Stripling & Roberts, 2012a, 2012b; Wilburne & Long, 2010), thus theoretically impacting the behavior of teaching mathematics.

Parnell (1996) claimed that “the basis for good teaching is combining an information rich subject matter content with an experience rich context of application” (p. 1), and Prescott, Richardson, Cockerill, and Baker (1996) purported that academic and vocational subjects should be integrated to maximize learning opportunities. With this in mind, Stone et al. (2006) experimentally investigated the Math-in-CTE model, which was developed as a means for enhancing mathematics instruction in Career and Technical Education (CTE). The study consisted of 236 CTE teachers, 104 mathematics teachers, and 3,950 secondary students. At the core of the model was a partnership formed between CTE and mathematics teachers in which the mathematics teachers aided the CTE teachers in developing math-enhanced lessons and were available for support before and after the lessons. As a result of instruction in secondary schools that utilized the math-enhanced lessons, the researchers discovered that technical skill acquisition was not diminished and that the CTE students’ mathematics content knowledge increased. Congruently, research in the field of agricultural education has supported the effectiveness of math-enhanced curricula that utilizes the seven elements of a math-enhanced lesson as a model for teaching contextualized mathematics (Parr, Edwards, & Leising, 2006, 2008; Young, Edwards, & Leising, 2009).

Personal Factors

In social cognitive theory, personal factors influence the external environment and behavior (Bandura, 1986). More specifically, in the context of this study, a preservice teacher’s self-efficacy and mathematics ability are personal factors that affect the behavior of teaching mathematics and the environment of the teacher education program. Correspondingly, the National Council of Teachers of Mathematics (NCTM; as cited in Benken & Brown, 2008) posited that teachers of mathematics should have an “integrated, connected view of mathematics, rather than a procedural, rule-based view” (p. 1). Similarly, Darling-Hammond and Bransford (2005) described three types of knowledge that are required for effective teaching: (a) subject matter knowledge, (b) pedagogical knowledge, and (c) pedagogical content knowledge. In the context of this study, mathematics ability and personal mathematics efficacy are measures of subject matter knowledge, personal teaching efficacy is a measure of pedagogical knowledge, and personal mathematics efficacy is a measure of pedagogical content knowledge.

Self-efficacy

Self-efficacy is one example of a personal factor that according to Bandura (1997) “occupies a pivotal role...because it acts upon the other classes of determinants” (p. 35). More explicitly, self-efficacy influences the activities one selects, motivation, knowledge acquisition, analytical thinking, and one’s talents (Bandura, 1986). Self-efficacy is defined as one’s judgment about one’s ability to perform a behavior or task (Bandura, 1997). Thus, a student’s self-efficacy regulates their learning and impacts their academic accomplishments (Bandura, 1993). Furthermore, teacher or teaching efficacy is a more specific type of self-efficacy (Strip-
ling, Ricketts, Roberts, & Harlin, 2008), and is a teacher’s belief in his/her capability to facilitate the learning environment and produce desired learning outcomes (Guskey & Passaro, 1994; Soodak & Podell, 1996). Teachers who are more efficacious persevere through challenges in the learning environment (Goddard, Hoy, & Woolfolk Hoy, 2004) and put forth more effort in designing learning activities (Allinder, 1994).

Previous research with preservice teachers found that teacher education programs should scaffold teaching experiences, thus reducing instances where preservice teachers lower their self-perceptions of what constitutes excellent teaching (Tschannen-Moran, Hoy, & Hoy K., 1998). In developing teacher efficacy, teacher education programs should provide opportunities for preservice teachers to state personal beliefs related to teaching and learning and then expand and integrate new knowledge into existing beliefs (Kagan, 1992). Specific to agricultural education, Knobloch (2001) discovered that peer-teaching increased preservice teacher’s teaching efficacy, and student teaching has been shown to have a positive effect on teaching efficacy (Harlin, Roberts, Briers, Mowen, & Edgar, 2007; Roberts, Harlin, & Ricketts, 2006; Roberts, Harlin, & Briers, 2008; Stripling et al., 2008). What is more, Roberts, Mowen, Edgar, Harlin, and Briers (2007) found that teaching efficacy was negligibly related to personality type, and Roberts et al. reported that placing two agricultural education preservice teachers at one internship site did not significantly affect teaching efficacy.

Mathematics ability

A plethora of research exists that underscores the mathematics deficiency among the nation’s preservice teachers (Adams, 1998; Ball & Wilson, 1990; Bryan, 1999; Even, 1990, 1993; Frykholm, 2000; Goulding et al., 2002; Matthews & Seaman, 2007; Michigan State University Center for Research in Mathematics and Science Education, 2010; Miller & Gliem, 1996; Stacey et al., 2001; Stoddart et al., 1993; Stripling & Roberts, 2012a, 2012b; Wilburne & Long, 2010). Correspondingly, research conducted with agricultural education preservice teachers has also revealed mathematical deficiencies (Miller & Gliem, 1996; Stripling & Roberts, 2012a, 2012b). To that end, Miller and Gliem (1996) found that preservice teachers at The Ohio State University scored 37.1% on an instrument used to measure agricultural mathematics problem solving ability. Likewise, Stripling and Roberts (2012a) reported that preservice teachers at the University of Florida averaged 35.6% on a mathematics assessment that was based on the national secondary agricultural education standards. Using the same assessment as Stripling and Roberts (2012a), Stripling and Roberts (2012b) reported that a randomly selected sample of preservice teachers from U.S. agricultural teacher education programs revealed that the nations’ preservice agricultural education teachers are not proficient in mathematics, and the population mean on the mathematics assessment was estimated to be between 28.5% and 48.5% with 95% confidence. Lastly, research in agricultural education has shown that an agricultural education teacher’s mathematics ability is significantly associated with their students’ mathematics ability (Persinger & Gliem, 1987).

External Environment – Teacher Education Program

According to Bandura (1986), the external environment is influenced by behavior and internal personal factors. For this study, the external environment is the agricultural teacher education program at the University of Florida. Considerable disagreement and debate surround the purpose of teacher education (Hansen, 2008); nevertheless, Myers and Dyer (2004) stated that the “goal of preservice teacher education is to make the most effective use of the time available to prepare future educators for the task awaiting them” (p. 47). In regard to teaching mathematics, teacher education programs should aid preservice teachers in fostering positive philosophies and attitudes about teaching and learning mathematics (Charalambous, Panayia, & Philippou, 2009). To that end, teacher education programs have been shown to influence how beginning teachers dialogue about teaching and learning mathematics (Ensor, 2001) and that research-proven mathematics instructional practices incorporated into a teacher education pro-

Journal of Agricultural Education

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gram positively affect student achievement (Berry, 2005). Burton, Daane, and Gieson (2008) further found that adding 20 minutes of mathematics content instruction into a teaching methods course positively affected mathematics content knowledge of preservice teachers. Research has also discovered that mathematics content knowledge was improved when preservice teachers experience content, teaching methods, and field experiences concurrently (Wilcox, Schram, Lappan & Lanier, 1991). Specific to agricultural teacher education, The National Standards for Teacher Education in Agriculture (American Association for Agricultural Education, 2001) suggested that general education should comprise one-third of the agricultural education program hours and should develop theoretical and practical understandings. Mathematics was specifically mentioned as an expectation of coursework within general education, yet recommendations for mathematics instruction and content knowledge were not given. Swortzel (1995) recommended that calculus and statistics/data analysis should be required, and this recommendation is supported by research that has found a substantial association between advanced mathematics or calculus and mathematics ability (Stripling & Roberts, 2012b). However, Swortzel’s article was the only reference found that recommended specific mathematics coursework for agricultural teacher education. Also, consistent with the disagreement mentioned above, variability exists in agricultural teacher education programs (McLean & Camp, 2000; Swortzel, 1999). For example, Swortzel (1999) reported that U.S. agricultural education programs were found in colleges of agriculture, education, and business or technology and credit hours for a four year degree ranged from 120-148. Moreover, McLean and Camp (2000) reported that the top 10 peer nominated agriculture teacher education programs had substantial variations in their required coursework or programs of studies. For example, McLean and Camp discovered 118 different topics were being taught with only 44 of the topics being taught in at least 50% of the programs.

**Purpose**

The purpose of this study was to investigate the effects of a MEAETM course on preservice agricultural education teachers’ mathematics ability, personal mathematics efficacy, mathematics teaching efficacy, and personal teaching efficacy.

Four null hypotheses were used to guide this inquiry:

H$_{01}$: There is no significant difference in the mathematics ability of preservice agricultural education teachers before and after the MEAETM treatment.

H$_{02}$: There is no significant difference in the personal mathematics efficacy of preservice agricultural education teachers before and after the MEAETM treatment.

H$_{03}$: There is no significant difference in the mathematics teaching efficacy of preservice agricultural education teachers before and after the MEAETM treatment.

H$_{04}$: There is no significant difference in the personal teaching efficacy of preservice agricultural education teachers before and after the MEAETM treatment.

**Methodology**

**Definition of Terms**

The following terms were operationally defined for this study:

- The teaching method course was operationally defined as a teaching and learning methods course that “focuses on the selection and use of teaching strategies, methods/approaches, and techniques; evaluating learning; and managing learning environments for teaching agricultural subjects in formal educational settings” (Roberts, 2009, p. 1).

- Mathematics ability is defined as the students’ scores on the Mathematics Ability Test (Stripling & Roberts, 2012a).

- Personal mathematics efficacy is the self-belief in one’s capabilities to solve mathematics problems. Personal mathematics efficacy was defined as the student’s score on 8 items contained in the Mathematics En-
Mathematics teaching efficacy is a person’s self-belief about their capabilities to teach mathematics. Mathematics teaching efficacy was defined as the student’s score on 13 items contained in the Mathematics Enhancement Teaching Efficacy Instrument by Jansen (2007).

Personal teaching efficacy is a person’s self-belief about their capabilities to teach. Personal teaching efficacy was defined as the student’s score on 12 items contained in the Mathematics Enhancement Teaching Efficacy Instrument by Jansen (2007).

Research Design

This study was preexperimental and utilized a one-group pretest-posttest design (Campbell & Stanley, 1963). The research design is shown below:

\[ O_1 \times O_2 \]

Threats to internal validity are history, maturation, testing, instrumentation, and possibly statistical regression (Campbell & Stanley, 1963). History is a limitation of this study, however, it should be noted that no participants were enrolled in a mathematics course during this study. Maturation and testing are also noted as limitations of this study; however, to reduce the influence of testing the posttests were given at the beginning of the 2011 semester instead of the end of the 2010 semester. Instrumentation was controlled by using a scoring rubric that was made by two secondary mathematics experts and by utilizing one scorer. Lastly, statistical regression is only a threat if subjects are selected based on extreme scores (Campbell & Stanley, 1963). In this study, the participants were not selected because of extreme scores.

Sample

The target population for this study was preservice agriculture teachers in their final year of a teacher education program at the University of Florida’s main campus. For this study, the sample was a purposive convenience sample that was conceptualized as a slice in time (Oliver & Hinkle, 1981), and according to Gall, Borg, and Gall (1996), when convenience sampling is used the researcher should provide a comprehensive description of the sample and describe the reasons for selection. To that end, the sample was selected based on previous research, which discovered that Florida preservice agricultural education teachers were not proficient in the mathematics content of the cross-referenced NCTM sub-standards (Stripling & Roberts, 2012a). The sample consisted of 22 preservice agricultural education teachers, 17 females and 5 males, that volunteered to participate and signed an informed consent that was approved by the University of Florida’s Institutional Review Board. The small sample size is a limitation of this study. The participants’ average age was 22 years old (SD = 1.41), and 21 of the participants described their ethnicity as white and one as other. Twenty of the participants were completing an undergraduate degree, and the remaining two participants were completing a graduate degree. The mean university grade point average was 3.53 (SD = 0.46).

Instrumentation

The participants agreed to complete the Mathematics Ability Test (Stripling & Roberts, 2012a) and the Mathematics Enhancement Teaching Efficacy Instrument (Jansen, 2007). The Mathematics Ability Test consist of 26 open-ended mathematical word problems and was utilized because it was developed based on the previously mentioned 13 NCTM sub-standard that are cross-referenced with the National Agriculture, Food and Natural Resources Career Cluster Content Standards (National Council for Agricultural Education, 2009). The instrument took approximately 60 minutes to complete and the reliability or the Cronbach’s alpha coefficient was reported by Stripling and Roberts (2012a) to be .80. Additionally, the researchers stated that a panel of experts comprised of two secondary mathematics experts and university agricultural teacher education and mathematics faculty representing three universities established face and content validity. The 26 open-ended mathematical word problems of the Mathematics Ability Test were scored as in-
correct, partially correct, or correct using a rubric that, according to Stripling and Roberts, was developed by two secondary mathematics experts. The Mathematics Enhancement Teaching Efficacy Instrument was developed and validated during a doctoral dissertation at Oregon State University and is divided into three constructs: (a) personal mathematics efficacy, (b) mathematics teaching efficacy, and (c) personal teaching efficacy. The instrument utilizes a different rating scale for each construct – personal mathematics efficacy (1 = not at all confident to 4 = very confident), mathematics teaching efficacy (1 = strongly disagree to 5 = strongly agree), and personal teaching efficacy (1 = nothing to 9 = a great deal of influence; Jansen, 2007). Jansen (2007) reported that face and content validity were established by a panel of experts and that the Cronbach’s alpha coefficients for the personal mathematics efficacy, mathematics teaching efficacy, and personal teaching efficacy constructs to be .84, .88, and .91, respectively. Scores for each construct were calculated by averaging the corresponding items after reverse coding items 2, 4, 5, 7, 9, 10, 11, and 13. The Mathematics Enhancement Teaching Efficacy Instrument took 8-12 minutes to complete.

Furthermore, each instrument was administered before and after the treatment utilized in this study. More specifically, the Mathematics Ability Test was administered the second week of the Fall 2010 semester and the first week of the Spring 2011 semester. The Mathematics Enhancement Teaching Efficacy Instrument was administered week three of the Fall 2010 and Spring 2011 semesters. Since the instruments were administered during instructional time, the preservice teachers were informed that volunteering to complete the instruments would not positively or negatively affect their course grade.

Treatment – MEAETM

The treatment for this study was devised by the researchers and was incorporated into the Fall 2010 agricultural education teaching methods course at the University of Florida as a potential means to improve the mathematics ability of the preservice teachers enrolled in the course. The treatment consisted of three parts. First, the researcher prepared and delivered a lecture to the preservice teachers that explained and demonstrated how to use the National Research Center for Career and Technical Education’s seven components of a math-enhanced lesson (Stone et al., 2006) to teach mathematical concepts in the context of agriculture (Figure 2). Second, each preservice teacher was randomly assigned two of the thirteen NCTM sub-standards that have been cross-referenced to the National Agriculture, Food and Natural Resources Career Cluster Content Standards.

Third, the preservice teachers were required to teach the two NCTM sub-standards to their peers using the seven components of a math-enhanced lesson (Stone et al., 2006). Therefore, each preservice teacher participated in the math-enhanced lesson lecture, integrated mathematics content that corresponds to their randomly assigned NCTM sub-standards into two of the normally required peer-teaching lessons of the teaching methods course, and participated in each other’s math-enhanced peer-teaching lessons. In summary, beyond what was previously required in the teaching methods course at the University of Florida the treatment added the following three elements: (a) a lecture on the seven components of a math-enhanced lesson, (b) random assignment of the NCTM sub-standards among the preservice teachers, and (c) requiring two of the peer-teaching lessons to be math-enhanced.
Figure 2. The National Research Center for Career and Technical Education: 7 Elements of a Math-Enhanced Lesson model (Stone et al., 2006, p. 13).

Data Analysis

Demographic and mathematics background data were summarized using descriptive statistics. Paired samples t tests were utilized to determine if a significant difference existed in mathematics ability, personal mathematics efficacy, mathematics teaching efficacy, and personal teaching efficacy scores from before to after the MEAETM treatment, and according to Agresti and Finlay (1997), t tests are appropriate for small sample sizes. In addition, Dunlap, Cortina, Vaslow, and Burke’s (1996) formula for calculating effect size was also used to correct for overestimation due to the correlation between measures.

Findings

Mathematics Ability

The pretest results revealed that 19 (86.4%) of the preservice teachers answered fewer than 50% of the items correctly on the mathematics ability instrument (Table 1). The mean score was 34.4% or 8.93 (SD = 3.78) on the 26 item instrument, and the scores ranged from 9.6% to 63.5%. The posttest results revealed that 63.6% of the preservice teachers answered fewer than 50% of the items correctly, and the mean score was 46.5% or 12.09 (SD = 4.25). The posttest scores ranged from 23.1% to 86.5%.

Table 1
Analysis of Scores on the Mathematics Ability Test

<table>
<thead>
<tr>
<th>Number correct (out of 26) range</th>
<th>% correct range</th>
<th>f</th>
<th>% of students</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.5 – 5.5</td>
<td>9.6 – 21.2</td>
<td>5</td>
<td>Pretest 22.7</td>
</tr>
<tr>
<td>6.0 – 9.0</td>
<td>23.1 – 34.6</td>
<td>8</td>
<td>Pretest 36.3</td>
</tr>
<tr>
<td>9.5 – 12.5</td>
<td>36.5 – 48.1</td>
<td>6</td>
<td>Pretest 27.3</td>
</tr>
<tr>
<td>13.0 – 16.5</td>
<td>50.0 – 63.5</td>
<td>3</td>
<td>Pretest 13.6</td>
</tr>
<tr>
<td>21.5 – 22.5</td>
<td>82.7 – 86.5</td>
<td>0</td>
<td>Pretest 0.0</td>
</tr>
</tbody>
</table>

Note. Pretest mean score 8.93 (SD = 3.78); posttest mean score 12.09 (SD = 4.25), out of 26 possible.

In addition, an analysis of hypothesis one revealed a 12.15% increase in scores after the MEAETM treatment (Table 2), and the increase in mathematics ability scores after the treatment was significantly different (p = .00). Thus, the null hypothesis was rejected. The practical significance of the difference was assessed using Cohen’s d, and the effect size was .78, which is a medium effect size according to Cohen (as cited in Kotrlik, Williams, & Jabor, 2011).
### Table 2
**Summary of Paired Samples t test**

<table>
<thead>
<tr>
<th></th>
<th>Mean difference</th>
<th>SD</th>
<th>SE</th>
<th>t</th>
<th>p</th>
<th>d</th>
</tr>
</thead>
<tbody>
<tr>
<td>Math ability posttest – pretest</td>
<td>12.15</td>
<td>10.97</td>
<td>2.34</td>
<td>5.19</td>
<td>.00</td>
<td>.78</td>
</tr>
</tbody>
</table>

### Mathematics Enhancement Teaching Efficacy

As depicted in Table 3, pretest results indicated that the preservice teachers in this study were confident in their mathematics ability (personal mathematics efficacy, $M = 3.46, SD = .39$), moderately efficacious in their ability to teach mathematics (mathematics teaching efficacy, $M = 3.37, SD = .71$), and perceived themselves as having “Quite a Bit of Influence” in affecting student learning (personal teaching efficacy, $M = 7.25, SD = .72$). Posttest results revealed that the preservice teachers were confident in their mathematics ability (personal mathematics efficacy, $M = 3.35, SD = .65$), moderately efficacious in their ability to teach mathematics (mathematics teaching efficacy, $M = 3.45, SD = .60$), and perceived themselves as having “Quite a Bit of Influence” in affecting student learning (personal teaching efficacy, $M = 7.34, SD = .80$).

### Table 3
**Mathematics Enhancement Teaching Efficacy Scores**

<table>
<thead>
<tr>
<th></th>
<th>Personal Mathematics Efficacy (PME)</th>
<th>Mathematics Teaching Efficacy (MTE)</th>
<th>Personal Teaching Efficacy (PTE)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$M$</td>
<td>$SD$</td>
<td>$M$</td>
</tr>
<tr>
<td>Pretest</td>
<td>3.46</td>
<td>.39</td>
<td>3.37</td>
</tr>
<tr>
<td>Posttest</td>
<td>3.35</td>
<td>.65</td>
<td>3.45</td>
</tr>
</tbody>
</table>

*Note. Scales: personal mathematics efficacy (1 = not at all confident to 4 = very confident), mathematics teaching efficacy (1 = strongly disagree to 5 = strongly agree), and personal teaching efficacy (1 = nothing to 9 = a great deal of influence; Jansen, 2007).*

Furthermore, analysis of hypotheses two, three, and four revealed a .11 point decrease on a 4-point scale in personal mathematics efficacy, a .09 point increase on a 5-point scale in mathematics teaching efficacy, and a .09 point increase on a 9-point scale in personal teaching efficacy after the MEAETM treatment (Table 4). However, the mean differences were not statistically significant. Thus, the null hypotheses were not rejected.

### Table 4
**Summary of Paired Samples t tests – Self-Efficacy**

<table>
<thead>
<tr>
<th></th>
<th>Mean difference</th>
<th>SD</th>
<th>SE</th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>PME posttest – pretest</td>
<td>-.11</td>
<td>.52</td>
<td>.11</td>
<td>1.00</td>
<td>.33</td>
</tr>
<tr>
<td>MTE posttest – pretest</td>
<td>.09</td>
<td>.90</td>
<td>.20</td>
<td>.45</td>
<td>.66</td>
</tr>
<tr>
<td>PTE posttest – pretest</td>
<td>.09</td>
<td>1.06</td>
<td>.23</td>
<td>.37</td>
<td>.72</td>
</tr>
</tbody>
</table>

### Conclusions/Implications/Recommendations

The MEAETM treatment had a positive effect on the preservice agricultural education teachers’ mathematics ability scores, and the practical significance of the difference in the scores was described as medium ($d = .78$). Consistent with Burton et al. (2008), the incorporation of mathematics into a teaching methods course may significantly increase the mathematics ability of preservice teachers. The results of this study were also consistent with Pascarella and Terenzini (2005), which stated that peer interaction that reinforce academics “appear to influence positively knowledge acquisition and academic skill development during college” (p.
Furthermore, these results support Bandura’s (1986) social cognitive theory, and the belief that cognitive skills can be socially cultivated. With that in mind, this study suggests that peer-teaching that utilizes the seven components of a math-enhanced lesson (Stone et al., 2006) may be an appropriate means to improve the mathematics ability of preservice agricultural education teachers. Therefore, the authors recommend that the MEAETM treatment be incorporated into the agricultural education teaching methods course at the University of Florida. Due to the limited scope of this study, future research should further investigate the effects of mathematics peer-teaching on preservice teachers’ mathematics ability.

Furthermore, the preservice teachers were confident in their personal mathematics efficacy before and after the MEAETM treatment. This is very interesting since the self-efficacy data was collected after the administrations of the mathematics ability instrument and despite a mean pretest ability average of 34.4% and a mean posttest average of 46.5%. Theoretically, Bandura’s (1986) social cognitive theory would suggest that confidence in personal mathematics efficacy should positively influence the behavior of teaching mathematics found naturally in the secondary agricultural curricula. On the other hand, Bandura’s social cognitive theory would also suggest that low mathematics ability should negatively influence the behavior of teaching mathematics in the secondary agricultural curricula. Thus, future research should seek to explain this disconnect between personal mathematics efficacy and mathematics ability among the preservice teachers. With that in mind, it is conceivable that even after the treatment of this study that the preservice teachers are ill-informed of the level of mathematics present in the secondary agricultural education standards. Therefore, future research should examine preservice teachers’ perceptions of the mathematics found naturally in the secondary agricultural curricula. Additionally, research should inquire into the development of personal mathematics efficacy and investigate factors that influence personal mathematics efficacy among preservice agricultural teachers. The aforesaid research is vital, since personal mathematics efficacy is a preservice teacher’s perception of their mathematics content knowledge, which Darling-Hammond and Bransford (2005) would call subject matter knowledge. Subject matter knowledge is an essential type of knowledge for effective teaching (Darling-Hammond & Bransford, 2005).

What is more, the preservice teachers were moderately efficacious in mathematics teaching efficacy and efficacious in personal teaching efficacy before and after the treatment. This fact is encouraging because mathematics teaching efficacy is a measure of the preservice teachers’ perceptions of their ability to teach mathematics, and personal teaching efficacy is a measure of the preservice teachers’ perceptions of their ability to teach in general. However, why are preservice teachers moderately efficacious in teaching mathematics when they are not proficient in mathematics after the treatment of this study? Future research should examine this issue. Additionally, research should seek to determine if the MEAETM treatment has an impact on the teaching of mathematics content in secondary agricultural classes once the preservice teachers graduate. Also, are the preservice teachers more likely to successfully integrate mathematics after graduation as a result of the MEAETM treatment, and do the preservice teachers with the highest mathematics ability scores produce students with higher scores like the secondary agriculture teachers in Persinger and Gliem (1987)?

Furthermore, the authors recommend that additional empirical research be conducted to validate the effectiveness of the MEAETM treatment in other preservice agricultural teacher populations. The authors also recommend that a quasi-experimental research design be utilized to further examine the effectiveness of the MEAETM treatment. Moreover, future research should determine if mathematics can be effectively and efficiently integrated into other agricultural teacher education courses. To that end, it is plausible, that the summative effect of small changes made to agricultural teacher education coursework, which emphasizes mathematics integration may produce preservice agricultural education teachers that are proficient in mathematics and aid the agricultural education profession in answering the numerous calls to assist in improving secondary students’ mathematics achievement. However, agricultural teacher ed-
ucators must be willing to integrate mathematics into agricultural teacher education coursework and be willing to provide assistance when pre-service teachers encounter mathematical difficulties or be able to suggest sources of support and remediation.

References


CHRISTOPHER T. STRIPLING is an Assistant Professor in the Department of Agricultural Leadership, Education and Communications at the University of Tennessee, 320B Morgan Hall, 2621 Morgan Circle, Knoxville, TN 37996-4511, cstripling@utk.edu

T. GRADY ROBERTS is an Associate Professor of Agricultural Education in the Department of Agricultural Education and Communication at the University of Florida, PO Box 110540, Gainesville, FL 33261, groberts@ufl.edu

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The Effect of Human Capital on Principals’ Decisions to Interview Candidates in Agricultural Education: Implications for Pre-service Teachers

J. Shane Robinson  
*Oklahoma State University*  
Marshall A. Baker  
*Lincoln Academy, Stillwater, OK*

The purpose of this experimental study was to determine which factors of human capital were valued most by principals regarding their decisions to interview candidates, based on teacher resumes. The findings of this study point to the fact that principals desire teachers who are academically rigorous. That is, they desire teachers who have strong grade point averages, have been recognized in honor societies for their academics, and have taken elevated, rigorous coursework above and beyond what a typical agricultural education major would be required to take. The sex and certification route of teacher candidates had no bearing on principals’ decision to offer an interview to the candidates. The fact that principals placed little value on certification type is concerning. It is recommended that this study be replicated in other states across the country to determine the prototypical agriculture teacher. It is assumed that the needs will vary from state to state. However, additional research is needed in this area.

Keywords: human capital, teacher candidates, principals’ perceptions

“One of the most important roles a building administrator plays is recommending the employment of teachers to the superintendent of schools” (Sulaver, 2008, p. 58). Unfortunately, principals do not always hire the best, most qualified candidates (Ballou, 1996; Wise, Darling-Hammond, & Berry, 1987). Sometimes principals make bad hiring decisions due to their own personal bias. Other times they miss out on possible, effective teachers due to the system’s red tape (Wise et al., 1987). Regarding personal bias, principals can and do make biased decisions on the hiring process of teachers. In fact, principals tend to select teachers who have similar academic backgrounds as their own (Baker & Cooper, 2005). Unbiased factors contributing to not hiring the best candidate include a lack of strong recruitment strategies, cumbersome and ineffective screening processes, and lengthy decision processes (Wise et al., 1987). Goldhaber and Brewer (2000) opined “it may be the case that states do not have a significant effect on the quality of teachers in the classroom because they are actually doing little to screen out poor candidates” (p. 131). Therefore, principals should make efforts to tighten their requirements and screenings to obtain the best, most qualified, and effective teachers possible (Wise et al., 1987).

Determining what constitutes a quality teacher is somewhat contradicting (Baker & Cooper, 2005) and challenging to define (Feistritzer & Haar, 2008). The dilemma of whether or not teachers should experience teacher preparation programs has been ongoing. Mixed results exist as to whether effective teachers are those who have learned pedagogy in teacher preparation programs or who have learned content-specific knowledge in undergraduate programs (Wilson & Floden, 2003). According to the report, *What Matters Most: Teaching for America’s Future*, published by the National Commission on Teaching and America’s Future (NCTAF) (1996), quality teachers are those who are astute at pedagogy. However, a study by Goldhaber and Brewer (2000) found that no statistically significant difference existed in student performance regarding those who
were taught by teachers trained in pedagogy versus those who were not. Wayne and Youngs (2003) found that students who had a traditionally certified mathematics teacher statistically outperformed those students who had a mathematics teacher who was alternatively certified. Yet, when comparing other disciplines, no difference in students’ test scores was found.

Roberts and Dyer (2004a) conducted a study to determine what characteristics embodied an effective agriculture teacher. They found that to be effective, agricultural educators should be proficient at advising the local FFA program, supervising supervised agricultural experiences, building community relations, marketing the local program to community patrons, exhibiting professionalism, planning and managing the total program, and being a quality person. Although, agriculture teachers who are alternatively certified believe they are sound in implementing effective pedagogy (Duncan & Ricketts, 2008; Roberts & Dyer, 2004b; Robinson, Krysher, Haynes, & Edwards, 2010; Rocca & Washburn, 2006), Robinson et al. (2010) found that there was a statistically significant difference regarding student achievement indicators in favor of traditionally certified teachers when comparing them with their alternatively certified counterparts. Regardless of certification type, pedagogical experiences such as lesson planning, lifelong learning, curriculum design, assessment strategies, professionalism, and classroom management are crucial skills for entry-level teachers to possess (Rosenfeld, Reynolds, & Bakatko, 1992; Rosenfeld & Tannenbaum, 1991).

Retaining quality teachers has been a major issue in education for years (Hess, 2000; Ruhland & Bremer, 2002). Because of the lack of certified teachers, the demand for teacher quality continues to escalate (Feistritzer & Haar, 2008; Good, McCaslin, Tsang, Zhang, Wiley, Bozack, & Hester, 2006). As such, ensuring that today’s school children are equipped with quality teachers is an imperative task (Goldhaber & Brewer, 2000). Because principals can set the precedence for the school’s culture by the type of teachers they hire (Baker & Cooper, 2005), it is important to determine which factors appeal to them most when screening applications.

In a literature review to determine which factors appeal most to principals when making hiring decisions regarding potential teachers, it was found that, typically, female principals place greater emphasis on learning about the potential teachers’ background and experiences than do their male counterparts (Sulaver, 2008). These areas of emphasis include the “candidate’s dedication to the profession, ability to build relationships, knowledge of teaching and learning, and information received from reference calls” (p. 48).

Experience and knowledge appear to play a vital role in a candidate’s success at advancing through the screening committee and landing an interview (Sulaver, 2008), as they are strong predictors of student achievement (Wayne & Youngs, 2003). However, a teacher’s knowledge should not be misconstrued to indicate grade point average (GPA). In fact, in a study of female and male principals, they both had the least amount of value regarding candidates’ honors and awards listed on their application, and as such, tended to devalue a candidate’s GPA as well (Sulaver, 2008). Therefore, being strong academically does not always lead to employment for aspiring teachers (Ballou, 1996; Weeks, 2006). Ballou (1996) noted that some principals have little regard for teachers’ with strong academic backgrounds. Rather, they desire individuals who can build relationships with students and teach them to think.

Understanding the perceptions of the principal regarding the agriculture program and its teacher is important because the “principal’s perceptions influence whether or not an agricultural education program exists” (Smith & Myers, 2012, p. 160). To determine which criteria were most important to administrators who employ high school agriculture teachers in Oklahoma, Cantrell and Weeks (2004) found that agricultural subject knowledge was preferred most. Administrators desired teachers who were well rounded in the program with experiences in classroom and laboratory instruction, FFA, and SAE. However, they had little regard for teachers’ general education knowledge. In a similar study, Weeks (2006) found that administrators preferred candidates who expressed an enthusiastic attitude to teach and could develop positive relationships within the community.
The criteria valued least by administrators were teachers’ experiences in production agriculture, involvement in activities while in college, and GPA.

Given the opportunity to compare, do principals prefer candidates with teacher preparation credentials (traditionally certified) or life experiences (alternatively certified) (Wilson & Floden, 2003)? Cantrell and Weeks (2004) found that administrators in Oklahoma preferred agricultural education teachers who were traditionally certified (TC) to those who were alternatively certified (AC). TC teachers have pedagogical preparation (Robinson, 2010) whereas AC teachers do not (Darling-Hammond, 2000; Feistritzer & Haar, 2008; Lynch, 1996; Walsh & Jacobs, 2007). However, generally, AC teachers have industry experiences (Ruhland & Bremer, 2002) whereas TC teachers do not. Therefore, which set of experiences, skills, knowledge, and education leads to employability for those who have a desire to teach? Answering this question has implications for how teacher preparation equips aspiring teachers for employment.

This study was framed using the human capital theory. Human capital is based on a person’s acquisition of knowledge, skills, experiences, and education (Becker, 1964; Little, 2003; Shultz, 1971; Smith, 2010; Smylie, 1996). Human capital is used widely to explain employability (Becker, 1964); thus, as people increase their human capital, they become more employable, especially when their human capital deals with learning new, “sector-specific” skills (Smith, 2010, p. 42). As individuals develop and acquire these skills, they should become more competent at performing their trade (Heckman, 2000). Employees are more valuable if their human capital results in increased profits within their job (Lepak & Snell, 1999). Although human capital has been used widely in economics literature, it can also be used to describe the value of teachers in school systems (Smylie, 1996).

Human capital is based on how unique an individual’s skills are regarding a potential job and how much the employer values those skills (Lepak & Snell, 1999). However, research determining which areas of human capital is most valued and unique within teacher development and preparation is lacking. Hess (2000) stated, “there is some agreement on what teachers should know but no consensus on how to . . . ensure that they have mastered essential skills or knowledge” (p. 169). Therefore, the question remains – which factors of human capital are valued most by school principals?

**Purpose of the Study**

The purpose of this experimental study was to determine which factors of human capital were valued most by principals regarding their decisions to interview candidates, based on teacher resumes. The following objectives guided the study.

1. Describe the variance in factors of human capital that principals desire most.

2. Describe the interaction between factors of human capital in assessing fit of a teacher candidate.

3. Describe the association between the factors of human capital and principals’ decisions to interview the candidates or not.

4. Describe what type of teacher candidate receives an interview.

The following hypotheses guided the statistical analysis of the study:

H₀₁: There is no variance in overall mean resume scores due to the interaction of rigor, certification, and sex.

H₀₂: There is no difference in the overall mean resume score between academically rigorous and non-rigorously teacher candidates.

H₀₃: There is no difference in the overall mean resume score between traditionally and alternatively certified teacher candidates.

H₀₄: There is no difference in the overall mean resume score between male and female teacher candidates.

H₀₅: Rigor has no association with principals’ decision to interview.
H0 6: Certification type has no association with principals’ decision to interview.
H0 7: Sex has no association with principals’ decision to interview.

Methods

This experimental study employed a completely randomized factorial two-by-four (CRF-24) design (Kirk, 1995), and focused on all principals who worked at schools that have an existing agricultural education program (N = 351) in Oklahoma during the 2011-2012 academic year. The frame for the study was adopted from a database used and shared by state staff program specialists at the Agency of Career and Technology Education in Oklahoma. Within the database were principals’ names, phone numbers, school name, mailing addresses, and electronic mail addresses. In the case of three principals, incomplete data existed. As such, the researchers conducted an Internet search and made phone calls to the schools to obtain the appropriate electronic mailing address to update the database and reduce frame error. A MANOVA was utilized to ensure homogeneity of principals assigned to each group based on age, years of experience, and school size, which was non-significant (V = .05, F(7, 74) = 1.605, p < .05).

Using the human capital theory as a frame, the researchers developed the instrument used for this study (see Figure 1). Because resumes are generally the first step to a candidate being selected for a job interview (Cole, Field, & Giles, 2003), eight “fictitious” resumes were created and various treatment variables were manipulated for comparisons. Each resume contained one of the completely crossed treatment combinations of two variables related to human capital – characteristics and sex. For instance, the resume for James Smith (see Table 1) was designed so that the candidate was traditionally certified and strong in academic rigor. Specifically, the resume for James Smith consisted of having a high grade point average, being a Truman Scholar finalist, and serving on the Dean’s List. In contrast, the resume for Susan Martin was designed so that the candidate was alternatively certified and exhibited weak academic rigor. In particular, no student teaching experience was denoted on the resume. Rather, a degree in animal science and experiences as a ranch manager were listed, indicating alternative certification status. Each of the ensuing resumes was altered so that a combination of treated variables existed. So as not to be biased in name selection, the website, http://www.census.gov/genealogy/names/names_ files.html, that represented the top ten male and female names of 2011 was used to determine the names found in the candidates’ resumes. Each resume was kept at a one-page minimum to avoid taxing the principals and ensure consistency.

The researcher-designed resume instruments served as the medium by which the various treatment combinations were administered (see Table 1). Each resume consisted of four sections that would be identified in a typical resume: education, relevant experience, FFA experience, and college and university involvement (see Figure 1). Polarity of both academic rigor and type of certification were sought through manipulations in the education and relevant experience sections of the resume. The resumes of candidates who were academically rigorous included a 4.0 Grade Point Average (GPA), demanding coursework, and recognition associated with academic success. Candidates who were academically non-rigorous reported a 2.0 GPA, introductory coursework only, and no academic recognitions. Candidates who were certified through a traditional route had an agricultural education degree and listed their student teaching experience. Candidates who were certified through an alternative route had a degree in animal science and listed their experience working in the agricultural industry. Both the FFA experiences and college or university involvement sections were identical on all eight resumes, as they were not of interest to this study. Thus, they were controlled and used for assessing for reliability.

The researchers were careful to ensure that each of the four sections of the resume consisted of 16 bullet points and followed the same overall format. Further, each resume contained 184 to 197 total words and followed strict formatting guidelines as to prevent principal bias (see Table 1).
Table 1
Overview of the Treatment

<table>
<thead>
<tr>
<th>Resume # - Name</th>
<th>Male</th>
<th>Female</th>
<th>Certification¹</th>
<th>Academic Rigor</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 – James Smith</td>
<td>X</td>
<td>X</td>
<td>TC</td>
<td>AC</td>
</tr>
<tr>
<td>2 – David Anderson</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 – Robert Brown</td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>4 – Michael Miller</td>
<td>X</td>
<td></td>
<td>AC</td>
<td></td>
</tr>
<tr>
<td>5 – Mary Johnson</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 – Barbara Wilson</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>7 – Linda Davis</td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>8 – Susan Martin</td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>

Totals 4 4 4 4 4 4 4

Note. ¹TC = Traditionally Certified; AC = Alternatively Certified

Part one of the instrument consisted of a resume scoring rubric where principals were asked to utilize a scale of 1 to 10, with 1 being worst and 10 being best, to score each section of the resume. The four scores were added to calculate an overall resume score. Part two of the questionnaire consisted of selected, personal characteristics data of the principals. The researchers were interested in both homogeneity of principals' characteristics between groups and future analysis of how their previous experiences, such as sex, years of experience, disciplines in which they taught, disciplines in which they were certified to teach, and FFA membership history as a youth, affected the way in which they screened the resumes. Thus, for the purpose of this study, the researchers reported only the quantitative data collected in Part I of the questionnaire.

Figure 1. Sample of Resume #1: Male, Rigorous, Traditionally Certified Candidate; Resume #8: Female, Non-Rigorous, Alternatively Certified Candidate.
Face and content validity was established on the resumes by faculty in teacher preparation and statistics at Oklahoma State University. Reliability was established through a pilot test of the instrument to principals not randomly selected to participate in the study. Because rhetoric is especially important when writing effective resumes (Amare & Manning, 2009), it was important to determine if principals could distinguish between traditionally certified and alternatively certified resumes. As such, two resumes, one being TC and the other being AC, were sent electronically to 30 principals as a pilot study. Principals were asked to evaluate and score the four sections of the resumes. Once completed, access to the resumes was suspended and the principals were asked to identify whether each candidate was traditionally or alternatively certified. Specifically, once principals had scored the resumes in the pilot study, they advanced to a page with a question asking about the certification status of the candidates. They were unable to go back and review the resumes when responding to this question, and therefore, had to answer the question based on memory. This question was especially important to the researchers as aspiring teachers in this state receive a standard teaching certificate regardless of certification route, often making it confusing to principals when assessing candidates’ teaching certificates. Anecdotal evidence exists that suggests principals do not always know if the candidates they interview are alternatively or traditionally certified. Therefore, aside from the interview itself, the resume is the only distinguishable artifact that would inform principals of a teachers’ certification route. On completing the pilot study, it was determined that over 70% of principals were able to identify correctly teachers’ certification route based on the education and experiences listed within the respective resumes. Therefore, the certification route was included in the larger study.

Each principal received an electronic mail message with the purpose of informing the principal of the study and soliciting participation. Because the study was conducted electronically, a computer system was employed to handle the random assignment of resumes to the participants. For instance, once a principal agreed to participate in the study, his or her identification number was accepted into the system automatically, and a resume was submitted for him or her to review and score. The system added resumes numerically (resume #1 through resume #8) in an attempt to ensure that equal numbers of resumes were reviewed and scored throughout the study.

To determine the number of principals needed for the study, a statistical program known as G*Power was used (Faul, Erdfelder, Lang, & Buchner, 2007), which is used to inform researchers on how many participants are needed for a particular study (Cohen, 1988; Faul et al., 2007). G*Power takes into consideration the number of people in the population, the number of variables in the study, and the amount of power desired. “Power . . . is the probability that its null hypothesis (Ho) will be rejected given that it is in fact false” (Faul et al., 2007, p. 175). When considering this study’s population (N = 351), the number of variables in the treatment (three), and a power base of .80, it was determined that 76 participants were needed (Faul et al., 2007).

The researchers followed Dillman’s (2004) recommendations for conducting electronic mail surveys. In all, principals were contacted a total of five times with an invitation to participate in the study. Specifically, an electronic mail message, complete with the resume questionnaire, was sent to all principals who were randomly selected for the study. Twenty-eight messages bounced back as undeliverable due to certain schools’ firewall protection systems. In those cases, the researchers faxed a copy of the electronic mail message to those principals soliciting their participation. The principals were asked to type the hyperlink into their web browser and participate in the study. Three additional contacts were made to principals until enough responses had been gathered necessary to detect an effect without committing a Type II error (Faul et al., 2007). In all, 83 principals participated in the study.

Findings

The first four null hypotheses sought to describe the variance in factors of human capital that principals desire most and any interaction of
those factors. To that end, an omnibus analysis of variance (ANOVA) was utilized and is summarized in Table 3. Complete reporting of descriptive statistics is found in Table 2. Levene’s test of equality of error variance was used to ensure the assumption of equal variances and was not violated, and it yielded $F(7,75) = .627, p = .732$. Thus, homogeneity of variance was established. In addition, the examination of a histogram demonstrated an approximately normal distribution of the data.

Each principal provided an overall resume score using the researcher-developed instrument, and those scores were used to look for significant interactions between sex, certification type, and academic rigor. The maximum resume score was 40, and the grand mean was 26.92 ($SD = 6.82, n = 83$). Null hypothesis one was tested using the ANOVA procedure. The interaction effect of sex, certification, and rigor yielded an $F(1,75) = .205, p = .652$, $\eta^2_p = .000$, sex and certification yielded an $F(1,75) = .012, p = .915$, $\eta^2_p = .000$, sex and rigor yielded an $F(1,75) = .588, p = .446$, $^2 = .008$, certification and rigor yielded an $F(1,75) = 1.05, p = .308$, $\eta^2_p = .014$; thus, all interactions were determined to be non-significant, and null hypothesis one failed to be rejected.

### Table 2
**Descriptive Statistics**

<table>
<thead>
<tr>
<th>Treatment Combination</th>
<th>$M$</th>
<th>$SD$</th>
<th>$n$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male – Traditional – Rigor</td>
<td>30.60</td>
<td>5.74</td>
<td>10</td>
</tr>
<tr>
<td>Male – Traditional – Non-Rigor</td>
<td>22.43</td>
<td>7.34</td>
<td>14</td>
</tr>
<tr>
<td>Male – Alternative – Rigor</td>
<td>28.07</td>
<td>5.58</td>
<td>14</td>
</tr>
<tr>
<td>Male – Alternative – Non-Rigor</td>
<td>24.20</td>
<td>6.30</td>
<td>10</td>
</tr>
<tr>
<td>Female – Traditional – Rigor</td>
<td>30.63</td>
<td>5.76</td>
<td>8</td>
</tr>
<tr>
<td>Female – Traditional – Non-Rigor</td>
<td>26.00</td>
<td>7.64</td>
<td>10</td>
</tr>
<tr>
<td>Female – Alternative – Rigor</td>
<td>29.10</td>
<td>6.64</td>
<td>10</td>
</tr>
<tr>
<td>Female – Alternative – Non-Rigor</td>
<td>26.14</td>
<td>6.01</td>
<td>7</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>26.92</td>
<td>6.82</td>
<td>83</td>
</tr>
</tbody>
</table>

### Table 3
**Analysis of Variance Summary Table**

<table>
<thead>
<tr>
<th>Source</th>
<th>$SS$</th>
<th>$df$</th>
<th>$MS$</th>
<th>$F$</th>
<th>$p$</th>
<th>$\eta^2_p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
<td>53.21</td>
<td>1</td>
<td>53.21</td>
<td>1.28</td>
<td>.262</td>
<td>.017</td>
</tr>
<tr>
<td>Certification</td>
<td>5.65</td>
<td>1</td>
<td>5.65</td>
<td>.135</td>
<td>.714</td>
<td>.002</td>
</tr>
<tr>
<td>Rigor</td>
<td>475.06</td>
<td>1</td>
<td>475.06</td>
<td>11.38*</td>
<td>.001</td>
<td>.132</td>
</tr>
<tr>
<td>Sex * Certification</td>
<td>.48</td>
<td>1</td>
<td>.48</td>
<td>.012</td>
<td>.915</td>
<td>.000</td>
</tr>
<tr>
<td>Sex * Rigor</td>
<td>24.54</td>
<td>1</td>
<td>24.54</td>
<td>.588</td>
<td>.446</td>
<td>.008</td>
</tr>
<tr>
<td>Certification * Rigor</td>
<td>43.93</td>
<td>1</td>
<td>43.93</td>
<td>1.053</td>
<td>.308</td>
<td>.014</td>
</tr>
<tr>
<td>Sex * Certification * Rigor</td>
<td>8.55</td>
<td>1</td>
<td>8.55</td>
<td>.205</td>
<td>.652</td>
<td>.003</td>
</tr>
<tr>
<td><strong>Error</strong></td>
<td>3129.99</td>
<td>75</td>
<td>41.73</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>63940.00</td>
<td>83</td>
<td>41.73</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* $p < .05$.

The second, third, and fourth null hypotheses stated that there were no statistically significant differences in resume scores when comparing sex, certification type, and level of academic rigor respectively. Mean scores of female resumes were 27.97 ($SD = 6.65$), and males mean score was 26.15 ($SD = 6.90$). There was a non-significant main effect of sex on the overall resume score, $F(1,75) = 1.28, p = .262$, $\eta^2_p = .017$ with a power of .200. Traditionally certified candidate resumes scored a mean of 27.41 ($SD = 1.02$), while alternatively certified candidates mean score was 26.88 ($SD = 1.04$). Again, there was a non-significant main effect of certification type on resume scores, $F(1,75) = .14, p = .714$, $\eta^2_p = .002$ and a power of .065.
Resumes indicating high academic rigor scored a mean of 29.60 (SD = 1.02), and those of low academic rigor scored a mean of 24.69 (SD = 1.04). There was a statistically significant difference between the level of academic rigor and the principals’ scores of the resumes, $F(1,75) = 11.38$, $p = .001$, $\eta^2_p = .132$, and a power of .915. As a result of these analyses, the second and third null hypotheses were retained, and the fourth null hypothesis was rejected.

The fifth, sixth, and seventh null hypotheses sought to determine if the level of academic rigor, sex, and certification type is independent of the principals’ decision to interview a candidate. Once the principals scored their respective resume, they were asked a simple question, “Would you invite this candidate for an interview based on this resume?” These yes and no answers were used as categorical data in the employment of Chi-Square tests of association. The Chi-Square tests of association are presented in Tables 4, 5, and 6.

Table 4
Contingency Table by Interview Decision and Sex of Candidate

<table>
<thead>
<tr>
<th>Interview Decision</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Male Candidate</td>
<td>30 (62.5%)</td>
</tr>
<tr>
<td>Female Candidate</td>
<td>22 (62.9%)</td>
</tr>
<tr>
<td>Total</td>
<td>52</td>
</tr>
</tbody>
</table>

$\chi^2 (1, n = 83) = .001, p = .974$

Table 5
Contingency Table by Interview Decision and Academic Rigor of Candidate

<table>
<thead>
<tr>
<th>Interview Decision</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Rigorous</td>
<td>31 (73.8%)</td>
</tr>
<tr>
<td>Non-Rigorous</td>
<td>21 (51.2%)</td>
</tr>
<tr>
<td>Total</td>
<td>52</td>
</tr>
</tbody>
</table>

$\chi^2 (1, n = 83) = 4.525, p = .033$

The 83 principals agreed to interview 62.5% of the males, and 62.9% of the females (see Table 4). The Chi-Square yielded a value of .001, which was statistically non-significant. Teacher candidates whose resume indicated a high level of academic rigor were given an interview 73.8% of the time, while only 51.2% of the academically non-rigorous candidates received an interview (see Table 5). Academic rigor was statistically significantly associated with the principals’ decision to provide an interview, as made evident by the 4.525 Chi-Square score ($p = .033$). Finally, 64.3% of teacher candidates who were traditionally certified received an interview, and 61.0% of the alternatively certified teachers received interviews (see Table 6). The Chi-Square yielded a statistically non-significant score of .097, which indicated that certification status made no difference in principals’ decisions to interview candidates.
Table 6

Contingency Table by Interview Decision and Certification Type of Candidate

<table>
<thead>
<tr>
<th>Interview Decision</th>
<th>Yes</th>
<th>No</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Traditional</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Certification</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>27</td>
<td>15</td>
<td>42</td>
</tr>
<tr>
<td>No</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alternative</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Certification</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>25</td>
<td>16</td>
<td>41</td>
</tr>
<tr>
<td>No</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>52</td>
<td>31</td>
<td></td>
</tr>
</tbody>
</table>

$\chi^2 (1, n = 83) = .097, p = .755$

Objective four was to describe the type of teacher candidate resume that leads to an interview. Traditionally certified males and females, who exhibited a high level of academic rigor, received the highest interview percentages of 80% and 88%, respectively (see Table 7).

Table 7
Percentage of Candidates in Each Resume Category that Received an Interview (n = 52)

<table>
<thead>
<tr>
<th>Sex</th>
<th>Traditional Certification</th>
<th>Alternative Certification</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Rigor Non-Rigor</td>
<td>Rigor Non-Rigor</td>
</tr>
<tr>
<td>Male</td>
<td>8/10 (80%) 6/14 (43%)</td>
<td>10/14 (71%) 6/10 (60%)</td>
</tr>
<tr>
<td>Female</td>
<td>7/8 (88%) 6/10 (60%)</td>
<td>6/10 (60%) 3/7 (43%)</td>
</tr>
</tbody>
</table>

Conclusions

The purpose of this experimental study was to determine which factors of human capital were valued most by principals regarding their decisions to interview candidates based on teacher resumes. It is clear that principals in this study prefer academic rigor to that of all other factors of human capital. Although not overly shocking, this finding contradicts numerous studies (Ballou, 1996; Sulaver, 2008; Wayne & Youngs, 2003; Weeks, 2006) that found academic rigor (i.e., GPA and academic awards and honors) was devalued by principals when hiring teachers.

Sex had no bearing on principals’ decisions to interview candidates. In fact, principals were willing to interview almost identical numbers of males (62.5%) and females (62.9%), respectively. This finding is encouraging as only roughly 13% of the statewide population of agricultural education teachers in Oklahoma is female, currently (K. Murray, personal communication, September 4, 2010). Anecdotally, some aspiring female teachers in Oklahoma have expressed concern over whether or not they will be taken seriously for future jobs. They believe teaching agriculture is a male-only profession in Oklahoma and that they will struggle to obtain a teaching job. However, the findings of this study are encouraging. Regardless of sex, it was apparent that principals seek aspiring teachers who were academically rigorous as students, not whether they were male or female.

Regarding certification status, there was no statistically significant difference between the proportion of traditionally and alternatively certified teachers that principals were willing to interview. Specifically, principals were willing to interview 64.3% ($f = 27$) of candidates who were traditionally certified and 61.0% ($f = 25$) of candidates who were alternatively certified. Cantrell and Weeks (2004) determined that administrators in Oklahoma preferred TC candidates to AC candidates. However, the same claims cannot be made from this study. Although two more TC candidates were selected to receive interviews, the differences between them and AC teacher candidates were not statistically significant, indicating that principals...
have no bias toward candidates who student taught and are experienced in pedagogy. Finally, when combining all factors of human capital, candidates who were traditionally certified and had strong academic rigor were most likely to receive interviews, which refutes the assertions of Weeks (2006) and Ballou (1996). The second most likely to receive interviews were those candidates who were alternatively certified and had strong academic rigor.

**Recommendations for Research**

This study sought to determine which factors of human capital are valued most by principals regarding the resumes of teacher candidates. However, resumes are but one artifact used to apply for a job. Teachers also submit applications and cover letters, which are important components to the screening process (Sulaver, 2008). Cantrell and Weeks (2004) noted that being strong academically does not ensure employability as a teacher. Therefore, what does? Future research should assess principals’ ratings of various cover letters and application materials to determine the decisions principals make regarding these artifacts.

The findings of this study are limited to Oklahoma. However, each state’s teacher certifying institution(s) should understand more about how its hiring officials make decisions regarding teacher employability. Therefore, it is recommended that this approach to collecting data be replicated in other states to determine themes deemed most important for agricultural education teachers. Further, it is acknowledged by the researchers of this study that a principal is not the sole person who does all of the decisions when hiring new teachers. As such, further studies should assess individuals such as superintendents, school board members, and other stakeholders who have a role in the hiring of agricultural education teachers in Oklahoma and beyond.

The resounding finding of this study is that principals desire candidates with strong academic rigor. However, what is not clear is the type of academic rigor principals value most. For instance, do principals desire candidates who have double-majored in another technical area over those with a degree only in agricultural education? Likewise, do principals seek individuals who have minored in another technical area versus those who have not? Further research should explore these areas. Also, is it the college coursework taken by candidates in which principals place the most amount of emphasis, or is the candidates’ GPA the most important factor regarding academic rigor? To achieve the greatest amount of treatment effect per the academic rigor section of the resumes used in this study, GPA and coursework were combined. However, future research should manipulate and test those variables (i.e., high GPA and basic coursework versus high GPA and advanced coursework) to determine exactly how principals view, value, and reward academic rigor.

**Recommendations for Practice**

These findings should be shared with principals in Oklahoma at their annual conference. Based on the pilot data, it is assumed that some principals “default” to believing every teacher aspirant is traditionally certified and prepared pedagogically. It is also clear that a few principals are not able to distinguish which teachers are traditionally certified and which ones are alternatively certified based solely on the resumes. This is problematic. As such, principals should be made aware of and trained to recognize these differences so that they can make the best decision possible during the screening process.

Based on the findings of this study, faculty in agricultural education at Oklahoma State University should encourage students to improve their human capital in the area of academic rigor specifically. Students should be encouraged to improve their GPA and scholastic standings by receiving free tutoring and taking advantage of the writing center provided to increase students’ literary skills at Oklahoma State University. Further, students should be advised to take advanced coursework in science and mathematics.

**Implications and Discussion**

The findings of this study indicate clearly that principals seek aspiring teachers who are
competent, smart, and determined – as evidenced by their overwhelming desire for interviewing teachers with elevated GPAs, academic honors and awards, and rigorous coursework. Yet, this finding contradicts previous work done by Cantrell and Weeks (2004), which found that a candidate’s GPA was not a significant factor in principals’ decision to hire an agriculture teacher. Yet, this study showed that, with all things being equal, academic rigor was the lone aspect of human capital that made a statistically significant difference. However, rarely in life are all things equal. For instance, the adage, “It’s not what you know but who you know that matters,” applies here. Therefore, an implication exists that politics plays a large role in the hiring process of individuals in various sectors. As such, perhaps there are other factors (i.e., geographic location of the candidate) to consider regarding aspiring teachers’ human capital.

What is somewhat concerning is the lack of attention these principals placed on teachers’ certification status. With all things being equal, principals selected traditionally certified teachers. However, when given options, it appeared as though principals were willing to compromise the student teaching experience and pedagogical preparation for a more well-rounded candidate. Why is that? Could it be that the pressure to have students perform on end-of-instruction, standardized tests is so great that principals are willing to forgo the pedagogical experiences of candidates to find a teacher who has high, overall, general intelligence? If so, perhaps pre-service teachers should be encouraged to not only take more rigorous coursework, but also to minor or double major in other areas in addition to agricultural education. The findings of this study revealed that principals were willing to issue interviews to candidates at all costs so long as they had been academically rigorous while in college.

The preparation of teachers is a difficult endeavor. It is a struggle for teacher educators to ensure that pre-service teachers receive enough rigorous coursework and pedagogy while being required to maintain student credit hours to under 124. Are there ways in which pre-service teachers can learn pedagogy while taking upper-level coursework that is rigorous in nature? If so, how? Discussions are needed to understand how to accomplish this dilemma better.

It is refreshing that principals desire teachers who are academically astute. However, efforts should be made to improve teacher pay and increase incentives to teach for those who are in the upper echelon regarding academic rigor. Too often, students do not consider teaching seriously due to the fact that they can find industry jobs that pay better and have enticing incentive programs based on their skills and abilities. Although this issue likely will not be resolved any time soon, teacher educators at this institution will continue to recruit students to the major who are academically rigorous. Further, all current students at Oklahoma State University will be encouraged to provide their best efforts while at college, by taking advantage of the free tutoring sessions offered at this institution, and gain as many robust experiences as possible prior to applying for teaching jobs.

References


J. SHANE ROBINSON is an Associate Professor of Agricultural Education in the Department of Agricultural Education, Communications and Leadership at Oklahoma State University, 457 Agricultural Hall, Stillwater, OK 74078-6032, shane.robinson@okstate.edu
MARSHALL A. BAKER is a High School Principal at Lincoln Academy Stillwater Public Schools, 215 East 12th Avenue, Stillwater, OK 74074, marshall.baker@okstate.edu
A 20-Year Comparison of Teachers’ Agricultural Mechanics Laboratory Management Competency

Billy R. McKim
Texas A&M University
P. Ryan Saucier
Texas State University – San Marcos

Agricultural mechanics laboratory management skills are essential for school-based agriculture teachers who instruct students in an agricultural mechanics laboratory (Bear & Hoerner, 1986). McKim and Saucier (2011) suggested the frequency and severity of accidents that occur in these laboratories can be reduced when these facilities are managed by educators who are competent and knowledgeable in the area of laboratory safety and facility management. This study investigated changes in Missouri agriculture teachers’ perceived agricultural mechanics laboratory management competency from 1989 to 2008, percent changes between 1989 and 2008 and effect size were used to describe changes in importance and ability of the selected competencies. Results indicated that teachers in 2008 had more teaching experience than their predecessors, less university semester credit hours of agricultural mechanics instruction, taught courses with greater student enrollment in laboratories that had less working space per student. Further, teachers’ perceptions of the importance of agricultural mechanics laboratory management competencies had a negligible change. However, the changes in teachers’ perceived ability to perform development, writing, and planning competencies were notable.

Keywords: agricultural mechanics; laboratory management competency; agricultural education, professional development

According to Phipps and Osborne (1988), a total secondary agricultural education program consists of three essential and interdependent components. Classroom and laboratory instruction; independent experiential learning, commonly known as Supervised Agricultural Experience (SAE); and participation in the student leadership organization, specifically the National FFA Organization. Specialized laboratory facilities are often an integral element used for each of these three components (McKim & Saucier, 2011).

Agricultural education laboratories provide opportunities for students to actively engage in scientific inquiry and applications (Osborne & Dyer, 2000. Further, Hubert, Ullrich, Lindner, and Murphy (2003) wrote “agricultural education programs offer many unique hands-on opportunities for students to develop both valuable academic and vocational skills” (p. 1). This is especially true for the instructional area of agricultural mechanics. Phipps, Osborne, Dyer, and Ball (2008) noted that the primary objective of agricultural mechanics education is the development of the abilities necessary to perform the mechanical activities to be completed in agriculture. Johnson, Schumacher, and Stewart (1990) stated that students learn important psychomotor skills in agricultural mechanics education and that much of the instruction takes place in the school agricultural mechanics laboratory.

Laboratories are essential educational tools for agricultural mechanics programs. As Johnson and Schumacher (1989) noted, much of the instruction of agricultural mechanics information takes place in a laboratory setting. Phipps, et al. (2008) estimated that in many courses, the time allocated for instruction in agricultural mechanics comprises 25% to 40% of the total instructional time. However, Saucier, Schumacher, Funkenbusch, Terry, and
Johnson (2008) found that teachers used the laboratory for up to 66% of the allocated instructional time in some agricultural mechanics courses. Shinn (1987) reported that the amount of time devoted to laboratory instruction may comprise one-third to two-thirds of the total instructional time in many secondary agricultural education programs.

More recently, Saucier, Terry, and Schumacher (2009) found that Missouri agricultural educators spent almost 10 hours per week supervising students in an agricultural mechanics laboratory. Bear and Hoerner (1986) noted laboratory experiences are an integral component of agricultural mechanics instruction and efficient management of the school agricultural mechanics laboratories are essential to maximizing student learning. With the amount of instructional time spent in the various agricultural education laboratories (i.e., animal science laboratory, greenhouse, agricultural mechanics laboratory, floral design laboratory, etc.) in the U.S., it is critical that agriculture teachers receive laboratory management education.

According to Hubert, Ullrich, Lindner, and Murphy (2003), “if skill development is the focus of laboratory instruction, then thorough attention to all its components, including safety instruction, is essential” (p. 3). Johnson and Fletcher (1990) stated that agricultural mechanics students are exposed to equipment, materials, tools, and supplies that are potentially hazardous to their health and that could cause injury or death. Shinn (1987) stated that the agricultural mechanics laboratory must be a safe and well-organized environment if optimum student learning is to occur. In 1986, Burke described practices associated with efficient laboratory management. He listed the regulation of environmental factors, control of consumable supplies and storage of tools as areas that are important for the efficient and safe management of the agricultural mechanics laboratory. Further emphasizing the importance of safety in the agricultural mechanics laboratory, Swan (1992) noted that instructional safety programs are a must, and therefore, should be of high priority to the instructor. The most important responsibility of the instructor is to ensure the safety of the students.

In addition to the previously noted studies, others posited that among the most effective instructional techniques reported by teachers, were demonstrations, laboratories, and supervised student projects (Myers & Dyer, 2004)—arguably, the most frequently used methods for teaching agricultural mechanics. Saucier et al. (2008) noted that pre-service and existing teachers must be properly educated in agricultural mechanics laboratory management to provide a safe and efficient laboratory learning environment for agricultural mechanics students. This is especially true with the increased emphasis and scrutiny of Science, Technology, Engineering, and Mathematics (STEM) integration into agricultural education courses, evidenced in the National Research Agenda, Priority Area 3 (Doerfert, 2011). Thus, safe and efficient laboratory conditions are essential for teachers who integrate core curricula into agricultural education programs (Thompson & Balschweid, 1999; Myers & Dyer, 2004). Unfortunately, many agricultural educators do not receive adequate preparation prior to beginning their teaching careers, or after accepting a teaching position (Foster, 1986), to safely manage an agricultural mechanics laboratory. However, longitudinal comparison of teachers’ perceived ability to establish and maintain a safe and efficient laboratory learning environment is not present in the literature.

To guide the theoretical foundation of this study, researchers utilized Bandura’s theory of self-efficacy (1997). According to Bandura, self-efficacy is defined as the “beliefs in one’s capabilities to organize and execute the course of action required to produce given attainments” (p. 3). Moreover, self-efficacy influences a person’s choices, actions, the amount of effort they give, how long they persevere when faced with obstacles, their resilience, their thought patterns and emotional reactions, and the level of achievement they ultimately attain (Bandura, 1986). See Figure 1 for an illustration of the theory of self-efficacy.

According to Knobloch (2008), predetermined beliefs of teachers often influence how they connect academic content in the classroom to real-life applications in the laboratory. Based upon a review of literature, these beliefs are
developed in part to personal beliefs about the curriculum or content (Borko & Putnam, 1996; Moseley, Reinke, & Bookout, 2002; Pajares, 1992); availability of time, availability of classroom and laboratory instructional resources, level of preparation regarding the content (Thompson & Balschweid, 1999), comfort level with the content, (Knobloch & Ball, 2003), perceived value of the content (Lawrenz, 1985), past experiences with the content area (Calderhead, 1996; Thompson & Balschweid, 1999), teaching environment (Knobloch, 2001) and motivation (Bandura, 1997; Tschannen-Moran, Woolfolk-Hoy, & Hoy, 1998).

The development and performance of teachers is also influenced by the interaction of these personal and environmental factors and the situations in which they teach (Knobloch, 2001). Based upon these principles and the aforementioned review of literature, researchers sought to determine the fundamental foundational change in the need of agricultural mechanics laboratory management professional development in Missouri, as measured by the importance a teacher places on, and their ability to perform, selected agricultural mechanics laboratory management competencies.

Purpose and Research Questions

Agricultural mechanics continues to be one of the most popular courses in Missouri (T. Heiman, personal communication, September 2, 2008). However, more than 20 years have passed since the competence and educational needs of Missouri school-based agricultural mechanics teachers were assessed. Thus, the purpose of this study was to compare the perceptions of school-based agriculture educators in Missouri who manage agricultural mechanics laboratories, between 1989 and 2008, regarding selected agricultural mechanics laboratory management competencies. The following research questions were investigated to accomplish this purpose:

1. What were the personal and professional characteristics of school-based agricultural educators in Missouri who are responsible for managing an agricultural mechanics laboratory, specifically: age, sex, credit hours of agricultural mechanics coursework taken, hours spent supervising students in the agricultural mechanics laboratories per week, overall student enrollment in the agricultural mechanics program, and the largest student enrollment in an agricultural mechanics class?
2. Did Missouri school-based agricultural educators’ perceptions of the importance of selected agricultural mechanics laboratory management competencies change from 1989 to 2008?

3. Did Missouri school-based agricultural educators’ perceptions of their ability to perform selected agricultural mechanics laboratory management competencies change from 1989 to 2008?

**Procedures**

“Meta-analysis is a form of secondary analysis of pre-existing data that aims to summarize and compare results from different studies” (Newton & Rustedt, 1999, p. 281). Furthermore, meta-analyses “serve to combine results from multiple studies, and consequently, allow us to diminish our reliance on statistical tests from individual studies” (p. 281). Therefore, a form of meta-analysis was conducted by including the results reported by Johnson in 1989 and data collected as part of this study. Hence, the purpose of this study was to measure perceptual change of the importance of teachers’ ability to instruct selected agricultural mechanics laboratory management competencies. The target populations for this study were school-based agriculture teachers responsible for managing an agricultural mechanics laboratory in Missouri, during 1989 and 2008.

In 1989, Johnson noted that 240 school-based agriculture teachers, in Missouri, were responsible for managing an agricultural mechanics laboratory. Of the 240 school-based agriculture teachers, Johnson randomly selected and invited 200 school-based agriculture teachers to participate in a mailed survey that included 50 selected agricultural mechanics laboratory management competencies (Johnson & Schumacher, 1989). After three points of contact, Johnson received 168 (83%) usable responses, which served as the population for the initial point for comparison for this study.

In 2008, the agricultural education district supervisors from the Missouri Department of Elementary and Secondary Education (DESE) identified 424 school-based agriculture teachers, in Missouri, who were responsible for managing an agricultural mechanics laboratory. A simple-random sample of 205 school-based agriculture teachers was selected (Krejcie & Morgan, 1970) and served as the population for the second point of comparison for this study.

For consistency, data collection procedures in 2008 followed similar procedures to those implemented by Johnson in 1989. The data collection instrument used by Johnson in 1989 was initially developed by Johnson and Schumacher in 1988, using the Delphi technique with input from a national panel of agricultural mechanics education experts. Johnson’s 1989 instrument was a two-section instrument: The first section contained 50 agricultural mechanics laboratory management competency statements with two, five-point summed rating scales—one reflecting the importance of each competency, the other reflecting the subject’s perceived ability to perform each competency. The purpose of the second section was to collect demographic information. Johnson noted a panel of experts was used to assess face validity of the instrument prior to data collection. Johnson further noted Cronbach’s alpha coefficients, post hoc, ranged from .63 to .88 (n = 168).

The data collection instrument used to collect data in 2008 was a two-section, modified version of Johnson’s 1989 instrument. Modification of the instrument was necessary to split multiple-component (double-barreled and triple barreled) competencies into single-component competencies; thus, the original 50 competencies were expanded to 70 competencies. The second section of the instrument was designed to collect relevant demographic information from respondents.

The modified instrument used to collect data in 2008 was submitted to a panel of experts to determine face and content validity. The panel of experts (n = 7) was composed of four university faculty members with expertise in agricultural systems management, a university faculty member with expertise in agriculture teacher education, a teacher development specialist from the agricultural education division of DESE, and a university faculty member with expertise in research methods and data collection instrument design. To estimate reliability of the modified instrument, a pilot test composed of randomly selected school-based agriculture teachers (n = 30), not selected to comprise the 2008 compari-
son sample, yielded acceptable Cronbach’s alpha coefficients, as defined by Garson (2008), that ranged from .95 to .97.

Once validity and reliability were established, the instrument was administered to the 2008 comparison sample. Following Dillman’s (2007) recommendations, subjects were contacted five times via email and U.S. mail. Usable responses were received from 110 Missouri school-based agriculture teachers resulting in a 55% response rate. Non-response error was a relevant concern. Therefore, procedures for handling nonrespondents were followed as outlined as Method 2 in Lindner, Murphy, and Briers (2001): Days to respond was used as the independent variable in regression equations, where the primary variables of interest were regressed on the variable days to respond, which yielded no significant results ($p = .603$). Despite the lack of significant results, the 55% response rate is a limitation of this study and limits the ability to generalize beyond the respondents.

Data analyses were guided by the recommendations of Cohen (1988), Newton and Rudestam (1999), and Thalheimer and Cook (2002), regarding meta-analysis. Data relative to Johnson’s 1989 study were reportedly analyzed using Statistical Analysis System; frequency, percentages, means, and standard deviations were reported. Data relative to the 2008 study were analyzed using SPSS 17.0; frequency, percentages, means, and standard deviations were reported. Double-barreled items from the 1989 study that were subsequently revised in the 2008 study were excluded from the analyses in this study to ensure the most accurate comparisons. Comparative analyses of the 33 competencies that corresponded between the 1989 and 2008 data were conducted using a Microsoft Excel® spreadsheet for calculating Cohen’s $d$ from $t$-tests, developed by Thalheimer and Cook (2002); Cohen’s $d$ and percent change were reported for each competency. Furthermore, interpretations of Cohen’s $d$ and percent change were based on Thalheimer and Cook’s interpretations.

**Results**

A comparative summary of the demographic data from 1989 and 2008 was presented in Table 1. On average, school-based agriculture teachers had a greater amount of experience in 2008 than 1989. However, the number of total university semester credit hours of agricultural mechanics coursework was reduced by 35% from 1989 ($M = 17.39; SD = 9.93$) to 2008 ($M = 11.30; SD = 9.81$). The average number of hours per week devoted to agricultural mechanics laboratory instruction decreased and the number of students in the largest agricultural mechanics classes increased. The age of agricultural mechanics laboratories increased slightly and the size ($ft^2$) of agricultural mechanics laboratories decreased slightly. Annual consumable budgets, however, increased on average.

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>1989</th>
<th>2008</th>
<th>$\Delta M$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total years of teaching experience</td>
<td>168, 10.95</td>
<td>110, 12.20</td>
<td>+1.25</td>
</tr>
<tr>
<td>Total university semester credit hours of agricultural mechanics coursework</td>
<td>138, 17.39</td>
<td>100, 11.30</td>
<td>-6.09</td>
</tr>
<tr>
<td>Average hours per week devoted to agricultural mechanics laboratory instruction</td>
<td>163, 10.14</td>
<td>107, 9.44</td>
<td>-0.70</td>
</tr>
<tr>
<td>Number of students in largest agricultural mechanics class</td>
<td>168, 15.39</td>
<td>106, 16.28</td>
<td>+0.89</td>
</tr>
</tbody>
</table>

(Table 1 continues)
A comparative summary of perceived importance of agricultural mechanics laboratory management competencies between 1989 and 2008 was listed in Table 2. The competency with the greatest percent increase in perceived importance of agricultural mechanics laboratory management competencies between 1989 and 2008 was maintaining computer based records with a large increase ($\% \Delta = 29$) and a large effect size ($d = .99$). Making minor repairs to the agricultural mechanics laboratory facility had the next greatest percent change in perceived importance ($\% \Delta = 15; d = .46$), followed by making major agricultural mechanics lab equipment repairs ($\% \Delta = 14; d = .40$), both of which had a medium increase in percent change and medium effect size. The agricultural mechanics laboratory management competencies with the greatest percent decrease in perceived importance of agricultural mechanics laboratory management competencies between 1989 and 2008 were developing procedures for efficient storage/distribution of consumable supplies ($\% \Delta = -8; d = .43$) and silhouetting tool/equipment cabinets ($\% \Delta = -8; d = .27$), which indicated a small decrease for both competencies, with a medium and small effect size respectively.

Table 2
A Comparison of Missouri School-Based Agriculture Educators’ Perceptions of the Importance of Selected Agricultural Mechanics Laboratory Management Competencies Changed from 1989 ($n = 168$) to 2008 ($n = 110$)

<table>
<thead>
<tr>
<th>Competencies</th>
<th>1989 $M$</th>
<th>1989 $SD$</th>
<th>2008 $M$</th>
<th>2008 $SD$</th>
<th>Cohen’s $d$</th>
<th>$% \Delta$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maintaining computer based student academic records</td>
<td>2.91</td>
<td>1.06</td>
<td>3.74</td>
<td>0.99</td>
<td>0.81</td>
<td>29</td>
</tr>
<tr>
<td>Making minor repairs to the agricultural mechanics laboratory facility</td>
<td>3.19</td>
<td>1.09</td>
<td>3.66</td>
<td>0.89</td>
<td>0.46</td>
<td>15</td>
</tr>
<tr>
<td>Making major agricultural mechanics lab equipment repairs</td>
<td>3.66</td>
<td>0.88</td>
<td>3.99</td>
<td>0.77</td>
<td>0.40</td>
<td>9</td>
</tr>
<tr>
<td>Developing a written statement of agricultural mechanics lab policies/procedures</td>
<td>3.73</td>
<td>0.88</td>
<td>4.01</td>
<td>0.84</td>
<td>0.33</td>
<td>8</td>
</tr>
<tr>
<td>Developing a maintenance schedule for agricultural mechanics equipment</td>
<td>3.58</td>
<td>0.79</td>
<td>3.82</td>
<td>0.77</td>
<td>0.31</td>
<td>7</td>
</tr>
</tbody>
</table>

(Table 2 continues)
<table>
<thead>
<tr>
<th>Competencies</th>
<th>1989 M</th>
<th>1989 SD</th>
<th>2008 M</th>
<th>2008 SD</th>
<th>Cohen’s d</th>
<th>%Δ</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maintaining the agricultural mechanics laboratory in compliance with OSHA standards</td>
<td>3.85</td>
<td>0.92</td>
<td>4.11</td>
<td>0.92</td>
<td>0.28</td>
<td>7</td>
</tr>
<tr>
<td>Developing an accident reporting system</td>
<td>4.14</td>
<td>0.92</td>
<td>4.39</td>
<td>0.85</td>
<td>0.28</td>
<td>6</td>
</tr>
<tr>
<td>Arranging for a professional service person to make major equipment repairs</td>
<td>3.71</td>
<td>0.97</td>
<td>3.92</td>
<td>0.90</td>
<td>0.22</td>
<td>6</td>
</tr>
<tr>
<td>Administering first aid</td>
<td>4.22</td>
<td>0.83</td>
<td>4.42</td>
<td>0.87</td>
<td>0.24</td>
<td>5</td>
</tr>
<tr>
<td>Properly installing and maintaining safety devices and emergency equipment</td>
<td>4.42</td>
<td>0.74</td>
<td>4.60</td>
<td>0.66</td>
<td>0.25</td>
<td>4</td>
</tr>
<tr>
<td>Diagnosing malfunctioning agricultural mechanics lab equipment</td>
<td>4.18</td>
<td>0.79</td>
<td>4.33</td>
<td>0.74</td>
<td>0.20</td>
<td>4</td>
</tr>
<tr>
<td>Promoting laboratory safety by color coding equipment/marketing safety zones/posting appropriate safety signs and warnings</td>
<td>3.89</td>
<td>0.95</td>
<td>4.03</td>
<td>0.90</td>
<td>0.15</td>
<td>4</td>
</tr>
<tr>
<td>Developing educational projects/activities for students</td>
<td>3.92</td>
<td>0.73</td>
<td>4.02</td>
<td>0.71</td>
<td>0.14</td>
<td>3</td>
</tr>
<tr>
<td>Developing a system to document achievement of student competencies</td>
<td>3.71</td>
<td>0.86</td>
<td>3.82</td>
<td>0.81</td>
<td>0.13</td>
<td>3</td>
</tr>
<tr>
<td>Developing procedures to facilitate the storage/checkout/security of tools/equipment</td>
<td>3.77</td>
<td>0.87</td>
<td>3.87</td>
<td>0.85</td>
<td>0.12</td>
<td>3</td>
</tr>
<tr>
<td>Installing stationary power equipment</td>
<td>3.58</td>
<td>0.96</td>
<td>3.69</td>
<td>0.75</td>
<td>0.12</td>
<td>3</td>
</tr>
<tr>
<td>Developing a procedure to bill students for materials used in project construction</td>
<td>4.01</td>
<td>0.84</td>
<td>4.10</td>
<td>0.81</td>
<td>0.11</td>
<td>2</td>
</tr>
<tr>
<td>Developing a procedure to ensure proper agricultural mechanics lab clean up</td>
<td>4.14</td>
<td>0.82</td>
<td>4.22</td>
<td>0.76</td>
<td>0.10</td>
<td>2</td>
</tr>
<tr>
<td>Making minor agricultural mechanics equipment repairs</td>
<td>4.12</td>
<td>0.81</td>
<td>4.20</td>
<td>0.70</td>
<td>0.10</td>
<td>2</td>
</tr>
<tr>
<td>Estimating time required for students to complete projects/activities</td>
<td>3.58</td>
<td>0.79</td>
<td>3.66</td>
<td>0.77</td>
<td>0.10</td>
<td>2</td>
</tr>
<tr>
<td>Performing routine maintenance of agricultural mechanics lab equipment</td>
<td>4.11</td>
<td>0.72</td>
<td>4.18</td>
<td>0.74</td>
<td>0.10</td>
<td>2</td>
</tr>
<tr>
<td>Arranging equipment in the agricultural mechanics lab to enhance safety/efficiency/learning</td>
<td>4.20</td>
<td>0.73</td>
<td>4.26</td>
<td>0.67</td>
<td>0.09</td>
<td>1</td>
</tr>
<tr>
<td>Recognizing characteristics of quality tools/equipment</td>
<td>4.14</td>
<td>0.76</td>
<td>4.20</td>
<td>0.68</td>
<td>0.08</td>
<td>1</td>
</tr>
<tr>
<td>Developing a rotational plan to move students through agricultural mechanics skill areas</td>
<td>3.73</td>
<td>0.82</td>
<td>3.75</td>
<td>0.83</td>
<td>0.02</td>
<td>1</td>
</tr>
<tr>
<td>Developing objective criteria for evaluation of student projects/activities</td>
<td>4.01</td>
<td>0.66</td>
<td>4.03</td>
<td>0.73</td>
<td>0.03</td>
<td>0</td>
</tr>
<tr>
<td>Developing an identification system to deter tool/equipment theft</td>
<td>4.03</td>
<td>0.91</td>
<td>4.05</td>
<td>0.82</td>
<td>0.02</td>
<td>0</td>
</tr>
<tr>
<td>Inventorying shop tools, equipment and supplies</td>
<td>4.03</td>
<td>0.78</td>
<td>4.02</td>
<td>0.79</td>
<td>0.01</td>
<td>0</td>
</tr>
<tr>
<td>Utilizing technical manuals to order replacement/repair parts for agricultural mechanics lab equipment</td>
<td>3.89</td>
<td>0.83</td>
<td>3.90</td>
<td>0.86</td>
<td>0.01</td>
<td>0</td>
</tr>
<tr>
<td>Maintaining healthy environmental conditions in the laboratory</td>
<td>4.26</td>
<td>0.77</td>
<td>4.20</td>
<td>0.76</td>
<td>0.08</td>
<td>-1</td>
</tr>
<tr>
<td>Constructing welding booths, work benches, storage areas, etc.</td>
<td>3.76</td>
<td>0.85</td>
<td>3.66</td>
<td>0.88</td>
<td>0.12</td>
<td>-3</td>
</tr>
<tr>
<td>Updating agricultural mechanics course offerings</td>
<td>3.94</td>
<td>0.81</td>
<td>3.71</td>
<td>0.87</td>
<td>0.28</td>
<td>-6</td>
</tr>
</tbody>
</table>

(Table 2 continues)
A comparative summary of perceived ability to perform agricultural mechanics laboratory management competencies between 1989 and 2008 are listed in Table 3. The competency with the greatest percent increase in perceived ability to perform agricultural mechanics laboratory management competencies between 1989 and 2008 was maintaining computer based records with a large increase (%Δ = 35) and a large effect size (d = .97). Developing a written statement of agricultural mechanics lab policies/procedures was the competency with the next greatest percent change in perceived ability to perform (%Δ = 11; d = .44), which indicated a small increase in percent change and medium effect size.

The agricultural mechanics laboratory management competencies with the greatest percent decrease in perceived ability to perform agricultural mechanics laboratory management competencies between 1989 and 2008 were making minor agricultural mechanics lab equipment repairs (%Δ = -5; d = .26) and developing procedures to facilitate the storage/checkout/security of tools/equipment (%Δ = -3; d = .12), which similar to perceptions of most competencies (n = 21), was a negligible decrease. Additionally, the Cohen’s d value associated with making minor agricultural mechanics lab equipment indicated a small effect size which was the only notable effect size of the items with negative percent change values (n = 6). See Table 3.
### (Table 3 continued)

<table>
<thead>
<tr>
<th>Competencies</th>
<th>1989</th>
<th></th>
<th>Cohen’s Δ</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>Developing a rotational plan to move students through agricultural mechanics skill areas</td>
<td>3.26</td>
<td>0.86</td>
<td>3.58</td>
<td>0.84</td>
</tr>
<tr>
<td>Administering first aid</td>
<td>3.35</td>
<td>0.92</td>
<td>3.68</td>
<td>0.95</td>
</tr>
<tr>
<td>Developing procedures for efficient storage/distribution of consumable supplies</td>
<td>3.45</td>
<td>0.74</td>
<td>3.75</td>
<td>0.73</td>
</tr>
<tr>
<td>Developing a maintenance schedule for agricultural mechanics equipment</td>
<td>3.05</td>
<td>0.81</td>
<td>3.33</td>
<td>0.85</td>
</tr>
<tr>
<td>Promoting laboratory safety by color coding equipment/marketing safety zones/posting appropriate safety signs and warnings</td>
<td>3.26</td>
<td>0.86</td>
<td>3.53</td>
<td>0.95</td>
</tr>
<tr>
<td>Maintaining the agricultural mechanics laboratory in compliance with OSHA standards</td>
<td>3.20</td>
<td>0.87</td>
<td>3.41</td>
<td>0.92</td>
</tr>
<tr>
<td>Developing objective criteria for evaluation of student projects/activities</td>
<td>3.42</td>
<td>0.77</td>
<td>3.60</td>
<td>0.78</td>
</tr>
<tr>
<td>Arranging for a professional service person to make major equipment repairs</td>
<td>3.57</td>
<td>0.93</td>
<td>3.75</td>
<td>0.85</td>
</tr>
<tr>
<td>Arranging equipment in the agricultural mechanics lab to enhance safety/efficiency/learning</td>
<td>3.68</td>
<td>0.74</td>
<td>3.81</td>
<td>0.80</td>
</tr>
<tr>
<td>Developing a procedure to bill students for materials used in project construction</td>
<td>3.64</td>
<td>0.88</td>
<td>3.77</td>
<td>0.90</td>
</tr>
<tr>
<td>Diagnosing malfunctioning agricultural mechanics lab equipment</td>
<td>3.48</td>
<td>0.62</td>
<td>3.60</td>
<td>0.79</td>
</tr>
<tr>
<td>Recognizing characteristics of quality tools/equipment</td>
<td>3.75</td>
<td>0.71</td>
<td>3.87</td>
<td>0.85</td>
</tr>
<tr>
<td>Performing routine maintenance of agricultural mechanics lab equipment</td>
<td>3.73</td>
<td>0.75</td>
<td>3.83</td>
<td>0.92</td>
</tr>
<tr>
<td>Constructing welding booths, work benches, storage areas, etc.</td>
<td>3.80</td>
<td>0.70</td>
<td>3.88</td>
<td>0.88</td>
</tr>
<tr>
<td>Inventorying shop tools, equipment and consumable supplies</td>
<td>3.75</td>
<td>0.84</td>
<td>3.82</td>
<td>0.80</td>
</tr>
<tr>
<td>Making agricultural mechanics lab equipment repairs</td>
<td>3.32</td>
<td>0.93</td>
<td>3.40</td>
<td>1.10</td>
</tr>
<tr>
<td>Utilizing technical manuals to order replacement/repair parts for agricultural mechanics lab equipment</td>
<td>3.70</td>
<td>0.86</td>
<td>3.76</td>
<td>0.92</td>
</tr>
<tr>
<td>Updating agricultural mechanics course offerings</td>
<td>3.39</td>
<td>0.75</td>
<td>3.43</td>
<td>0.88</td>
</tr>
<tr>
<td>Silhouetting tool/equipment cabinets</td>
<td>3.32</td>
<td>0.99</td>
<td>3.35</td>
<td>0.94</td>
</tr>
<tr>
<td>Properly installing and maintaining safety devices and emergency equipment</td>
<td>3.90</td>
<td>0.80</td>
<td>3.89</td>
<td>0.82</td>
</tr>
<tr>
<td>Making minor repairs to the agricultural mechanics laboratory facility</td>
<td>3.52</td>
<td>0.92</td>
<td>3.48</td>
<td>0.98</td>
</tr>
<tr>
<td>Maintaining healthy environmental conditions in the laboratory</td>
<td>3.66</td>
<td>0.86</td>
<td>3.63</td>
<td>0.75</td>
</tr>
<tr>
<td>Installing stationary power equipment</td>
<td>3.52</td>
<td>0.84</td>
<td>3.49</td>
<td>0.96</td>
</tr>
<tr>
<td>Developing an identification system to deter tool/equipment theft</td>
<td>3.53</td>
<td>0.90</td>
<td>3.45</td>
<td>0.89</td>
</tr>
</tbody>
</table>
Conclusions/Implications/Recommendations

School-based agricultural mechanics teachers in Missouri, on average had more years of teaching experience in 2008 than their predecessors in 1989. Conversely, the number of university semester credit hours of agricultural mechanics coursework received during preservice education has decreased. Although slightly reduced, school-based agricultural mechanics teachers continued to devote more than 11 hours per week, on average, to agricultural mechanics laboratory instruction. Larger class sizes and smaller agricultural mechanics laboratory size resulted in a reduced amount of space per student. On average, budgets increased; however, budgets varied greatly in 1989 and 2008. In 1989, the average agricultural mechanics consumable supply budget was $2,426; in 2008 the average budget increased to $2,900. Although the average budget increased between 1989 and 2008, by nearly $500, the average agricultural mechanics consumable supply budget would have needed to increase to $4,349, to account for the 2.82% annual inflation over the nearly 20 year period—an increase of $1,923 to account for inflation alone (Dollar-Times, 2010), rather than $500. Therefore, the increased amount of average budgets is misleading and concerning given the increased number of students enrolled.

Twenty-two of the 33 agricultural mechanics laboratory management competencies had a negligible percent change in perceived importance between 1989 and 2008. Similarly, the percent change in perceived ability of school-based agriculture teachers to perform agricultural mechanics laboratory management competencies between 1989 and 2008 was also negligible for 21 of the 33 competencies. The greatest increases in percent change in perceived ability to perform agricultural mechanics laboratory management competencies were related to development, writing, and planning; arguably, competencies that can be classified as core laboratory management skills and knowledge.

Conversely, the second, third, and fourth greatest increases in percent change in perceived ability to complete agricultural mechanics laboratory management competencies require applied skills or knowledge of applied practices. Arguably, if school-based agriculture teachers who manage an agricultural mechanics laboratory are receiving less pre-service agricultural mechanics preparation, teaching in laboratories with more students who are allotted less space, accidents are more likely to occur. Therefore, we recommend that professional development opportunities be developed and offered to teachers in Missouri who manage these specialized laboratories in the areas of the most need: Safety, including administering first aid, OSHA laboratory safety standards, repairing and maintaining tools, and equipment that function safely for student use.

The National Research Agenda, Priority 3, suggested that “a sufficient supply of well-prepared agricultural scientists and professionals drive sustainable growth, scientific discovery, and innovation in public, private, and academic settings” (Doerfert, 2011, p. 18). These professionals include school-based agriculture teachers.
McKim & Saucier

A 20-Year Comparison

who must possess essential knowledge and skills in order to help aid in the development of a future workforce who can address societal and industry challenges (Doerfert, 2011). As society looks toward the future, it is imperative that “individuals must be well prepared for discovery science, teaching and learning, science, technology, engineering, and mathematics (STEM) integration…” (Doerfert, 2011, p.18). Acknowledging a review of literature, we recommend professional development opportunities be offered that not only aid school-based agricultural educators in acquiring the knowledge and skills needed to manage an agricultural mechanics laboratory but also in preparing a future workforce. Multiple in-service opportunities should be developed with the professional in mind, i.e., offering workshops that meet the scheduling needs of teachers and those that have high impacts on academic and career and technology skill acquisition for student learners. We further recommend a diverse array of professional development topics be offered including workforce development, safety, and STEM integration. Specifically, workshops designed to teach educators about the best practices for instructing STEM competencies to student learners within the various agricultural education curriculums currently found in many states. Many STEM integrated concepts are relevant to agricultural mechanics and can be instructed in a laboratory setting.

According to Osborne (2007), “well-designed professional development experiences, based upon teacher career stage, may improve teacher retention and program continuity” (p. 20). Additionally, literature suggests that “practicing teachers must have continuing access to high quality professional development programs” (Osborne, p. 20). Acknowledging the work of Osborne and others (Barrick et al., 1983; Birkenholz & Harbstreit, 1987; Saucier et al., 2008; Saucier et al., 2009), we recommend that a longitudinal study of pre-service and in-service secondary agriculture teachers’ perceived importance of agricultural mechanics laboratory management competencies and their ability to perform the competencies would provide teacher education programs “an additional gauge of the adequacy of agricultural mechanics curriculum in their pre-service teacher education program” (McKim & Saucier, 2011, p.84). Moreover, studies similar to this one should be conducted periodically in each state to ensure that the continuing education needs of teachers are met in the area of laboratory management and preparing a future workforce.

Recognizing that knowledge and technology related to agricultural mechanics constantly evolves and the average years of teaching experience of Missouri agriculture teachers is only 12 years, we recommend that a comprehensive assessment of professional development be conducted in each state, every five years, to address teacher professional development needs. Furthermore, these opportunities should be tailored for teachers based upon career stage, sex, location, and be facilitated by state supervisory staff or teacher educators and delivered by experienced teachers or industry professionals. These workshops should be delivered around the state of Missouri at local high schools and university campuses during times of the year that are convenient for teachers—summer, winter break, and during the annual teacher professional development conference. If the overall goal of education is to aid in the development of a future workforce that can meet the needs of 21st century employers, industry professional development partnerships should be investigated to determine if industry-delivered workshops (eg., Lincoln Electric welding workshop, Stihl or Briggs and Stratton small gas engine workshop, CASE institute) can also adequately meet the in-service needs of school-based agriculture teachers.

As a result of this study and other recent studies in Missouri, state-funded professional development staff have offered both centralized and regional professional development opportunities to teachers in the area of agricultural mechanics skill acquisition, i.e., agricultural electrification, and laboratory management. These workshops have been offered at the various post-secondary institutions in Missouri, at local high schools, and at the summer teachers’ conference. A continued effort is needed in Missouri to meet the ever growing demands of teachers through 21st-century professional development opportunities.
References


BILLY R. MCKIM is an Assistant Professor in the Department of Agricultural Leadership, Education, and Communications at Texas A&M University, 2116 TAMU, College Station, TX 77843-2116, brmckim@tamu.edu

P. RYAN SAUCIER is an Assistant Professor of Agricultural Education/ Agricultural Systems Management in the Department of Agriculture at Texas State University-San Marcos, 601 University Drive, San Marcos, TX 78666, ryansaucier@txstate.edu
Two Decades of Agricultural Literacy Research: A Synthesis of the Literature

Kristin A. Kovar
Anna L. Ball
University of Missouri

The purpose of this investigation was to identify and synthesize research related to agricultural literacy since the publication of Understanding Agriculture—New Directions for Education (1988). The researchers sought to determine where agricultural literacy research was published, which populations were targeted, the purpose of the research, and the findings of agricultural literacy studies published between 1988 and 2011. Overall, a total of 49 studies were found - 17 studies in the Journal of Agricultural Education, seven studies in the NACTA Journal, three studies in the Journal of Extension, 18 studies in national or regional American Association for Agricultural Education (AAAE) conference proceedings, and four miscellaneous studies. The populations targeted in agricultural literacy research were teachers, students, and non-educator adults with elementary teachers and students being the most frequently targeted populations. The purposes of the respective studies were coded into three specific areas: (a) assess agricultural literacy; (b) test the effectiveness of an agricultural literacy program; or (c) develop a framework or guide used to assist educators. While the programs were found to be successful in increasing agricultural literacy, many populations assessed were found to be agriculturally illiterate. Further research is warranted to explain areas of deficiency in agricultural literacy.

Keywords: agricultural literacy; research synthesis

“As our global population grows to a projected nine billion people by 2050, the non-agriculture population has little to no understanding of the complexities involved with sustaining a viable agriculture system” (Doerfert, 2011, p. 8). With a steady increase in the planet’s population, changes affecting agriculture are occurring such as increased production needs, widespread urbanization, and regulation and policy changes. The National Research Agenda for the American Association of Agricultural Education (AAAE) outlines six key research priority areas. Research priority one is “Public and Policy Maker Understanding of Agriculture and Natural Resources” (Doerfert, 2011). The emphasis placed on understanding agriculture in a modern world through research priority one communicates the need for an agriculturally literate society. Agricultural literacy is defined as an “understanding of the food and fiber system [that] includes its history and current economic, social, and environmental significance to all Americans” (National Research Council (NRC), 1988, p. 1).

With fewer people directly involved in production agriculture and the complexity of agricultural issues presented to legislatures, the need for an agriculturally literate society is imperative so that informed individuals are able to make educated decisions regarding agriculture (Pope, 1990). The steady rise of urbanization has transferred the future of agriculture to a group of people with an overwhelming lack of support for agricultural issues. Agriculturally literate Americans are more likely to support policies affecting agriculture than those Americans lacking agricultural literacy (Ryan & Lockaby, 1996).

Controversy in agriculture has continued to increase over the years due to genetically modified crops, animal rights, and food safety issues (Leising, Igo, Heald, Hubert, Yamamoto, 1998). Organizations and special interest groups have attacked the agricultural industry using the guise of creating an “informed public.” An
agriculturally literate population is able to see beyond emotional pleas and make informed decisions on these issues. A society with an understanding of agriculture and current economic, social, and environmental impacts could lessen current challenges facing agriculture through good decision making along with providing the necessary support.

Research efforts in agricultural literacy began after a publication by The National Research Council in September of 1988 entitled Understanding Agriculture—New Directions for Education (1988). This report was the result of a study initiated in 1985 due to concerns about the diminishing profitability of American agriculture and the decrease of agricultural education enrollments in secondary schools. At the request of U.S. Secretaries of Agriculture and Education, the National Research Council established the Committee on Agricultural Education in Secondary Schools to assess the contributions of agricultural instruction on the economic impact of U.S. agricultural production (Frick, Kahler, & Miller, 1991). Upon publication of Understanding Agriculture—New Directions for Education (1988), research on the concept of agricultural literacy began and has continued throughout the last 23 years.

Publication of Understanding Agriculture—New Directions for Education (1988) sparked many changes in the management and operation of agricultural education programs in secondary schools. The publication stressed the establishment of programs in urban and suburban settings as well as a broadening of agricultural instruction. It also motivated a change in exclusivity by removing terms such as vocational, straying from traditional boundaries and attracting students of diverse interests. Aligning curriculum with science-based instruction methods and promoting a goal of increased program ethnic diversity was also encouraged (NRC, 1988).

Agriculture as a whole has changed drastically since the publication of Understanding Agriculture—New Directions for Education (1988). The agricultural industry went through extremely trying times and financial crises in the 1980s, as evident in the dramatic rise of interest rates peaking over 20 percent, as well as a high debt-to-asset ratio (Boehlje & Hurt, 2008). Financial issues are still a concern in current times, but with agricultural loans at a much lower 4.5 percent and a significantly lower debt-to-asset ratio across the industry, agriculture is in a more secure position than it was in the 1980s. Another change is the rise of corporate farming resulting in fewer people involved in production agriculture. As agriculture changed drastically over the years, one would expect to see a change in how society understands agriculture as well.

Over the last two decades, the core concept of agricultural literacy, the understanding of agriculture, has stayed the same. However, understanding agriculture in 1988 and understanding agriculture in 2012 are two vastly different concepts. The change in technology alone warrants a new framework in which to examine agricultural literacy. Other changes include organic farming, ethanol production, international trade, buying local, environmental stewardship and climate, genetically modified organisms, as well as many other trends in agriculture. Agricultural educators designed programs to increase agricultural literacy prior to the publication of Understanding Agriculture—New Directions for Education (1988), but society is still considered agriculturally illiterate. If the concepts of agricultural literacy have evolved, but is being assessed through traditional methods, is the understanding of agriculture truly being evaluated?

**Purpose**

As seen in the most recent AAAE National Research Agenda priority areas, agricultural literacy is still an concern in the agricultural education discipline. There is a need to summarize and synthesize agricultural literacy research to determine if the attempts made in creating agriculturally literate populations were successful and determine what has been learned about agricultural literacy in the last two decades. Synthesizing the findings of agricultural literacy research may highlight where the research has been and where it needs to go in the future.

The purpose of this investigation was to identify and synthesize research related to agricultural literacy since the publication of Understanding Agriculture—New Directions for Education...
Based on this purpose, the following research questions were developed:

1. What studies were conducted in agricultural education regarding agricultural literacy?
2. What populations were targeted in agricultural literacy research?
3. What was the purpose of agricultural literacy research?
4. What findings and recommendations were suggested based on a summary of the agricultural literacy research?

**Methods/Procedures**

The design for this study was a research synthesis. A synthesis of research is beneficial by gathering “trustworthy accounts that accumulate past research [which aids in] knowledge building” (Cooper, 2010, p.1). Building knowledge of the result of 23 years of agricultural literacy research is a needed task for the benefit of not only agricultural education, but the global industry of agriculture as well. The search and inclusion criteria utilized three essential strategies for rigor in research syntheses including search strategies, inclusion criteria, and coding (Cooper, 2010). Specific strategies incorporated an exhaustive search of library databases, such as ERIC and PsychINFO, along with Google Scholar and journal websites. Keywords and phrases included in the search were “agricult* literacy” and “agricult* education”. Articles containing agricultural literacy research were documented and saved for analysis.

The publication of *Understanding Agriculture—New Directions for Education* (1988) was selected as the parameter for this search given the focus placed on agricultural literacy, introducing the concept into agricultural education research. Establishing inclusion criteria prior to the literature search is necessary in maintaining rigorous synthesis methods (Cooper, 2010). Inclusion criteria for this study were developed *a priori* and contained articles meeting the following specifications: (a) published in AAAE research conference proceedings (regional or national); (b) published in a peer-reviewed research journal; (c) included specific agricultural literacy terminology within the article; (d) available and accessible through search procedures; and (e) published between October 1988 and August 2011. Duplications of research, as well as studies not specifically using agricultural literacy terminology were excluded from the synthesis. Forty-nine studies met the inclusion criteria.

The majority of the 49 resulting studies were retrieved from the following data sources: (a) AAAE research conference proceedings (regional and national), (b) *Journal of Agricultural Education*, (c) *Journal of Extension*, and (d) *NACTA Journal*. A final category of (e) other included additional studies retrieved through the online search of agricultural literacy resources. Cooper (2010) suggests the use of a coding guide when examining a large number of studies. From this, 49 articles were organized and summarized into a matrix identifying the following characteristics: (a) article title, author(s), and year; (b) participants and sample size; (c) purpose of the study; (d) specific objectives; and (e) findings and conclusions. The matrix was beneficial in coding the data into emergent themes.

A single coder was responsible for finding and coding all agricultural literacy research. Reliability of coding was established through peer debriefs. According to Creswell (2007), peer debriefing provides an external check of the research process and asks hard questions about methods, meanings, and interpretations. Debriefing occurred at multiple stages of the study, including the analysis of the findings. Every research study meeting the inclusion criteria was compared and categorized based on similarities which organized the data into logical groups. Findings then guided the development of conclusions, implications, and recommendations.
Findings

Research Question One: What studies were conducted in agricultural education regarding agricultural literacy?

For research question one, the researchers sought to determine the location of studies within agricultural education research regarding agricultural literacy after the publication of *Understanding Agriculture—New Directions for Education* (1988). Forty-nine studies were identified through an exhaustive search that met the inclusion criteria (see Table 1).

Table 1

<table>
<thead>
<tr>
<th>Year</th>
<th>JAE</th>
<th>NACTA</th>
<th>JOE</th>
<th>AAAE Conferences</th>
<th>Total</th>
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</thead>
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<td>1994</td>
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<tr>
<td>2010</td>
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</tr>
<tr>
<td>2011</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>17</td>
<td>7</td>
<td>3</td>
<td>18</td>
<td>45</td>
</tr>
</tbody>
</table>

*Note: Four articles were found in miscellaneous journals. This category will be referred to as “other.”

Table 1 displays the number of studies published in the *Journal of Agricultural Education*, the *NACTA Journal*, *Journal of Extension*, or AAAE Conference Proceedings (national and regional). Beyond the four main categories, an “other” category was utilized to identify miscellaneous studies. There were no studies found on agricultural literacy in 1988 or 1989. All other years contained between one and four studies published within the year. The years 1994 and 1999 contained the highest number of studies published, four in each year. Overall, a total of 17 studies were found in the Journal of Agricultural Education, seven studies in the NACTA Journal, three studies in the Journal of Extension, 18 studies in national or regional conference proceedings, and four miscellaneous studies were identified. Other sources offering agricultural literacy research included *California Agriculture*, the *Texas Journal of Agriculture and Natural Resources*, and *Water, Air, and Soil Pollution*. 
Research Question Two: What populations were targeted in agricultural literacy research?

For research question two, the researchers sought to identify the target populations in agricultural literacy research after the publication of *Understanding Agriculture—New Directions for Education* (1988). Initial examination of the research, included a designation of population, which led to three emergent themes for the types of research populations targeted. The populations were then coded based on the themes into (a) teachers, (b) students, and (c) non-educator adults (see Table 2).

Table 2
Participant Groups Included in Agricultural Literacy Research, 1988-2011 (n=49)

<table>
<thead>
<tr>
<th>Target population</th>
<th>Frequency</th>
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<tbody>
<tr>
<td>Teachers</td>
<td></td>
</tr>
<tr>
<td>Elementary</td>
<td>4</td>
</tr>
<tr>
<td>High School</td>
<td>2</td>
</tr>
<tr>
<td>K-12</td>
<td>4</td>
</tr>
<tr>
<td>Students</td>
<td></td>
</tr>
<tr>
<td>Elementary</td>
<td>15</td>
</tr>
<tr>
<td>Middle School</td>
<td>4</td>
</tr>
<tr>
<td>High School</td>
<td>5</td>
</tr>
<tr>
<td>K-12</td>
<td>2</td>
</tr>
<tr>
<td>College</td>
<td>3</td>
</tr>
<tr>
<td>4-H member</td>
<td>4</td>
</tr>
<tr>
<td>Non-educator adults</td>
<td></td>
</tr>
<tr>
<td>Community members</td>
<td>6</td>
</tr>
<tr>
<td>Total</td>
<td>49</td>
</tr>
</tbody>
</table>

Table 2 displays the frequency of participant groups utilized in the targeted research population. Teachers were coded as elementary teachers, high school teachers, or K-12 teachers. The highest frequencies of teachers studied were elementary and K-12 teachers. Examples of agricultural literacy research with elementary teacher participant groups included Terry, Herring, and Larke (1992) and Bellah and Dyer (2007). Terry et al. assessed fourth grade teachers’ understanding and use of agricultural concepts in their classroom to determine if assistance was needed to implement agricultural literacy programs. Bellah and Dyer (2007) described elementary teachers’ attitudes and perceptions of agriculture after completing a preservice agricultural literacy awareness course.

Students were coded as elementary students, middle school students, high school students, K-12 students, college students, or 4-H members/students. The highest frequency of studies targeted elementary students. One study involving an elementary student population was conducted by Meischen and Trexler (2003) in which they interviewed rural elementary students to determine students’ understandings of agriculture specifically related to meat and livestock.

Non-educator adults were coded as community members and included parents, officials, administrators, or other community leaders. Examples of studies focused on assessing agricultural literacy of non-educator adults included Wearly, Frick and Shelhamer (1999) and Braverman and Rilla (1991). Wearly et al. assessed the agricultural knowledge of elected officials in Montana’s 54th legislative session. Braverman and Rilla (1991) determined the agricultural views of three main stakeholder groups: county school superintendents, county career education directors, and school district superintendents.

Research Question Three: What was the purpose of agricultural literacy research?

For research question three, the researchers sought to identify the purpose of the agricultural literacy research as indicated by the author(s) of the study. Studies were coded based on one of three themes: (a) assessing agricultural literacy, (b) testing a program or (c) the development of a framework or guide (see Figure 1). The studies assessing agricultural literacy were determining the agricultural knowledge of a specific population. The studies testing a program were determining the success of programs used to disseminate agricultural literacy. The studies developing a framework or guide were creating either a list of competencies or a conceptual model for the improvement of agricultural literacy in a population, typically as a guide for classroom teachers.
Figure 1 displays the frequency of studies in each category of purpose as identified by the study. Of the 49 total studies found, 23 were identified with the purpose of assessing agricultural literacy. Specifically, those studies that sought to assess agricultural literacy identified the purpose of “determining understanding.” An example of research with the purpose of assessing agricultural literacy was a study of Southeast Missouri State University students designed to determine their knowledge and perceptions of issues related to agriculture, food, and the environment (Birkenholtz, Harris, & Pry, 1994).

Nineteen studies were identified that tested the effectiveness of an agricultural literacy program. The studies testing a program typically compared a control and treatment group or gave pre- and post-tests to determine knowledge gained. Programs tested included Ag in the Classroom (Pense, Leising, Portillo & Igo, 2005), AgVenture Magazine (Swortzel, 1997), Food, Land, and People lessons (Powell & Agnew, 2011), and Summer Agricultural Institute (Balschweid, Thompson, & Cole, 1998).

Seven studies were identified with the purpose of developing a framework or guide. These studies typically had a goal of developing a tool to guide and assist educators in teaching agricultural content (Frick, 1993; Hubert et al. 2000; Powell, Agnew, & Trexler, 2008). A study by Frick (1993) determined agricultural literacy subject areas to constitute a framework of a middle school agricultural education core curriculum. Hubert, Frank, and Igo (2000) sought to heighten awareness of a developed framework to improve food and fiber literacy in K-12 students. Powell et al. (2008) examined three approaches to agricultural literacy curriculum development, implementation, and assessment: inductive, deductive, and evaluative. They developed a conceptual model for agricultural literacy by examining multiple models.

**Research Question Four: What findings and recommendations were suggested based on a summary of the agricultural literacy research?**

For research question four, the researchers sought to examine the findings and recommendations of agricultural literacy research in order to guide or suggest directions for future research. Findings for the agricultural literacy research studies were in line with the specific purposes of the studies, which were to assess agricultural literacy of a population, test the effectiveness of an agricultural literacy program, or develop a framework or guide to assist...
teachers in the dissemination of agricultural literacy content.

Agricultural literacy assessment

Findings of the research studies in this synthesis focused on agricultural literacy assessment were coded as the populations being either agriculturally literate, possessing some agricultural knowledge, or agriculturally illiterate. A total of 23 studies had the goal of assessing agricultural literacy.

Six studies found participant groups (high school teachers, non-educator adults, and college students) to be agriculturally literate. For example, a study by Harris and Birkenholtz (1996) found that the secondary educator groups were knowledgeable about agriculture and had positive attitudes toward the agriculture industry. In another study, researchers found that elected officials in Montana’s 54th legislative session had positive perceptions of agriculture (Wearly et al. 1999).

Ten studies found participant groups (elementary students, middle school students, high school students, and non-educator adults) possessed some knowledge of agriculture. A study by Pense and Leising (2004) found both Oklahoma high school agricultural education and general education students possessed some agricultural knowledge and that the two groups did not differ in their levels of overall knowledge of agriculture. They also found that students from rural schools were less knowledgeable about agriculture than students attending urban or suburban schools.

Six studies found participant groups (elementary students, elementary teachers, and college students) to be agriculturally illiterate. For example, Hess and Trexler (2011) found informants lacked essential sub-concepts of agriculture that prevented them from developing schema needed for understanding agricultural benchmarks. Terry et al. (1992) found that a majority of teachers in Texas taught agricultural concepts in their classrooms, but had inaccurate perceptions of and limited knowledge of agriculture.

The remaining study by Colbath and Morris (2010) compared agricultural literacy in two groups. The researchers found after assessing a group of college freshmen that suburban students had the highest scores on agricultural literacy assessments when compared to rural and urban students. Comparing the agricultural literacy among groups allowed researchers to determine areas of weakness among populations and to identify where efforts should be focused in order to increase agricultural knowledge.

Program testing

A total of 19 studies tested the effectiveness of agricultural literacy programs. All studies revealed increases in understanding of agriculture among participants, but with varying levels of effectiveness. Some studies reported a higher program impact on agricultural literacy than others.

Findings of agricultural literacy research focused on program testing indicated materials or program utilized were effective in increasing agricultural competency. In a study assessing the program Ag in the Classroom by Pense et al. (2005), findings indicated Ag in the Classroom programs made positive differences in the K-6 student acquisition of knowledge about agriculture. California Agriculture published a research article by Rilla, Desmond, Braverman, Ponzio, Lee, Sandlin, & Kaney (1991) that assessed several agricultural literacy programs across California. Their findings indicated that there were four key components in order to have a successful agricultural literacy program. They were a dedicated, visionary leader, high levels of commitment from staff and administrators, a strong link between agricultural literacy education and classroom-based learning and adequate (material) resources. Monk, Norwood, and Guthrie (2000) found that observing a live cow milking demonstration greatly improved fourth grade students’ knowledge and understanding of the dairy industry. Finally, Mabie and Baker (1996) studied three groups of inner-city, minority, fifth- and sixth-grade students in Los Angeles, California. The groups were randomly assigned into the following treatments: (a) a ten-week garden project; (b) a ten-week series of in-class projects of bread baking, chick rearing, and seed germination; and (c) a control group that received no treatment. This study found that while the students had very little knowledge of
the food and fiber system prior to the treatments, their knowledge increased by participating in the activities.

Development of framework or guide

Seven studies were conducted with the purpose of developing a framework or guide. Three of those studies developed a framework for the purpose of identifying competencies necessary for the attainment of agricultural literacy. Two studies developed a conceptual model for examining agricultural literacy. The remaining two studies developed a guide for teachers to use to educate students about agriculture. Specifically, one of these two studies identified topics that constituted the core curriculum for a middle school agriculture program (Frick, 1993).

Findings of agricultural literacy research focused on developing a framework or guide indicated creating this framework was beneficial in determining content for agricultural literacy instruction. An earlier study by Frick et al. (1991) established eleven agricultural subject areas needed to achieve agricultural literacy. The eleven areas were 1) relationship with the environment, 2) agricultural processing, 3) public policies, 4) relationship with natural resources, 5) animal products, 6) societal significance, 7) plant products, 8) economic impact, 9) agriculture marketing, 10) distribution, and 11) global significance. The researchers then recommended that the eleven broad areas should be used in agricultural education curricula reform to increase agricultural literacy in K12, elementary, middle, and high schools.

Conclusions/Implications/Recommendations

Based on the findings in this study, it could be concluded that a majority of agricultural literacy studies have been published in the Journal of Agricultural Education and American Association for Agricultural Education conferences (national and regional) as compared to the Journal of Extension, the NACTA Journal and other sources. This implies that as a discipline, the field of agricultural education has mainly published within the field of agricultural education and has not ventured into other fields and venues. It is important to note that the studies included in this synthesis are limited by terminology in that only articles explicating the agricultural literacy terminology were included. Perhaps disciplines outside of agricultural education use different terminology in their research of agricultural literacy. Without this exception, a larger quantity of studies outside the discipline of agricultural education would indicate an expansion on the focus of agricultural literacy to broader audiences. According to Williams, “Research is of limited value unless the findings are made available to other researchers and practitioners” (1991, p. 20). Therefore, it is recommended that agricultural education researchers place a high priority on publishing research utilizing specific agricultural literacy terminology in non-agricultural education venues to increase knowledge of agricultural literacy outside the field of agricultural education and to market their findings.

It is further concluded that the populations most frequently targeted in agricultural literacy research are elementary teachers and students. The reasoning behind this may be traced back to an important statement extensively cited from Understanding Agriculture—New Directions for Education (1988). It states, “Agriculture—broadly defined— is too important a topic to be taught only to the relatively small percentage of students considering careers in agriculture and pursuing vocational agriculture studies” (NRC, 1988, p. 8). After the publication of Understanding Agriculture—New Directions for Education (1988), there was an increase in educating elementary students about agriculture, as well as focusing on elementary education participants in agricultural literacy studies. The major issue with targeting young audiences is to do so potentially excludes older audiences capable of directly impacting complex issues and policy decisions. According to Igo and Frick (1999), a well-informed, agriculturally literate society is needed for the continued success of the U. S. agriculture industry. Recommendations of the synthesis include expanding the focus of agricultural literacy research beyond elementary teachers and students. Examining high school teachers and students, as well as community members and leaders on a more frequent basis would better
indicate the number of agriculturally literate individuals making impactful decisions.

Further, it is concluded that the two main purposes for agricultural literacy research are to assess the agricultural literacy of a population or test an agricultural literacy program for effectiveness. These conclusions imply that assessing the agricultural literacy of a population and determining the effectiveness of a program are important goals in order to determine the next steps in agricultural literacy education. Together, the findings and recommendations of studies assessing literacy programs, as well as the agricultural competency of populations indicate the programs were successful in disseminating agricultural literacy, but many populations are still agriculturally illiterate. Perhaps, the agriculturally illiterate populations are simply not being reached by the efforts of agricultural literacy programs. Baseline data are needed to ascertain what students are learning about agriculture to provide key indicators of progress being made toward the achievement of program goals (Pense et al. 2005). It is recommended that researchers continue assessing the understanding of agriculture in all populations to determine weak areas in need of further intervention. Researchers should also continue testing programs for agricultural literacy effectiveness while also expanding the types of programs tested and the populations included in the programs.

Finally, it is concluded that when assessing populations, people are either agriculturally literate, possessing some knowledge of agriculture, or agriculturally illiterate. While assessing agricultural literacy, populations were also compared to determine areas of weakness. When testing a program, the findings indicate the materials or program were successful in increasing agricultural literacy. These findings may point to a disconnect between successful agricultural literacy programs and an agriculturally illiterate society. This could be due to programs not reaching a majority of people, or it could be that these programs are mostly operated on small scales in a specific states, towns, or even classrooms. According to Jepsen, Pastor, and Elliot (2007), most efforts to increase agricultural literacy through specific programs are intermittent, at best. If more programs were national in scope, such as Ag in the Classroom, more people across the country could be included in the program. These findings indicate researchers are assessing populations’ knowledge of agriculture, as well as assessing the materials and programs used to increase agricultural literacy in a variety of populations, but that the programs are not reaching a large portion of the population. It is recommended that researchers continue to assess populations and programs while increasing the variety of populations and programs assessed. Researchers should also identify areas of deficiency in research related to agricultural literacy efforts and continue these efforts in the future.

Agricultural literacy is a current issue, not only in American society, but globally. Knowledge and understanding of agriculture is necessary as the global population expands creating compounding issues of feeding the world, while establishing and maintaining a sustainable, viable agriculture system.

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KRISTIN A. KOVAR is a Doctoral Student in the Department of Agricultural Education and Leadership at the University of Missouri, 125 Gentry Hall, Columbia, MO 65211, kristin.kovar@mizzou.edu

ANNA L. BALL is Associate Professor of Agricultural Education in the Department of Agricultural Education and Leadership at the University of Missouri, 127 Gentry Hall, Columbia, MO 65211, ballan@missouri.edu

Notice of Correction

Anna L. Ball was originally listed as Anna L. Henry in the author’s line on this manuscript. This correction has been made in all online references to this paper as of March 27, 2013.
Assessing the Impact of a Semester-long Course in Agricultural Mechanics on Pre-service Agricultural Education Teachers’ Importance, Confidence, and Knowledge of Welding

Brian L. Leiby

Marionville, MO

J. Shane Robinson

James P. Key

Oklahoma State University

This study sought to assess the perceptions of Oklahoma pre-service agricultural education teachers regarding the importance of identified welding skills standards and their confidence to teach them, based on a semester-long course on metals and welding. This study also sought to determine pre-service teachers’ knowledge of welding prior to and at the end of instruction. It was found that pre-service teachers rated the seven constructs above average in importance; yet, they had below average confidence in their abilities to teach them at the beginning of the semester and between average and above average confidence at the end of the semester, which resulted in large practical effect sizes. Further, they increased their knowledge score from an F at the beginning of the semester to a C at the end of the semester, which was both statistically and practically significant. These pre-service teachers should be followed, longitudinally, to determine if and when they are able to fully master the skills and teach them effectively in the classroom and laboratory settings. Because agricultural mechanics is a vast field, future research should assess pre-service teachers’ perceived levels of importance and confidence in areas outside of welding, such as electricity, plumbing, and small gas engines.

Keywords: pre-service agriculture teachers; agricultural mechanics; human capital; competencies

With the restricting degree plans at a maximum of 128 total credit hours, teacher preparation programs find it difficult to include enough technical competency preparation for pre-service teachers (Burris, Robinson, & Terry, Jr., 2005; Robinson, Krysher, Haynes, & Edwards, 2010). Providing secondary students with adequate opportunities to acquire necessary technical competencies in agriculture is challenging, especially when considering the subject of agricultural mechanics (Burris et al., 2005).

Dillard (1991) stated that it can be difficult to produce prepared teachers of agricultural mechanics with a minimum requirement of seven credit hours. Currently, Oklahoma State University (OSU) requires only five credit hours in agricultural mechanics coursework. As such, a need exists to determine if the current agricultural mechanics coursework at OSU is meeting the needs of its pre-service agricultural education teachers, as they will likely be expected to teach it once they enter the profession.

Agricultural mechanics is a science-based curriculum that provides teachers with opportunities to integrate concepts of physics, chemistry, and mathematics (Miller, 1991). “Agricultural mechanics traditionally has been a cornerstone in the secondary program” (Burris et al., 2005, p. 23). As noted in 2009, 59 percent of the United States’ eleven thousand agricultural education instructors teach agricultural mechanics at their local school system (National FFA Organization, 2010). Therefore, ensuring that instructors are prepared to teach agricultural mechanics is critical.
Teacher preparation programs should focus on providing a high level of technical skill training in agricultural mechanics and strive to increase students’ confidence to teach it effectively because producing and retaining highly qualified teachers is imperative to the success of the United States as a country (Wallis, 2008). Kennel (2009) stated, “because teachers are the single most important influence on student achievement, teacher education programs need to provide learning experiences for pre-service educators to impact their confidence to teach pertinent subject matter and their perceptions of its importance” (p. 2). Unfortunately, not all entry-level teaching graduates are ready to assume the responsibilities of professional work roles (Levine, 2005). Therefore, preparation programs should take heed and strive to ensure its graduates are ready for employment.

Agricultural education is designed to be industry-validated as it strives to equip students with the skills, education, and training necessary to be successful in industry and post-secondary education (Roberts & Ball, 2009). Therefore, teachers should be competent at teaching all agricultural subject areas (Robinson et al., 2010) and strive to “link the teaching of academic subjects to real-world applications” (Carnevale, Gainer, & Villet, 1990, p. 237). To link education to the real-world, various states take different approaches. The state of Oklahoma has implemented skills standards for various subjects to help close the gap between the classroom and the workplace.

Skills standards provide the foundation for competency-based instruction in Oklahoma’s Career Tech system. The skills standards outline the knowledge, skills, and abilities needed to perform related jobs within an industry. Skills standards are aligned with national skills standards; therefore, a student trained to the skills standards, possesses technical skills that make him/her employable in both state and national job markets. (Oklahoma Department of Career and Technology Education [ODCTE], OD46903, 2006, p. A)

Competent, qualified teachers are the backbone of high-quality instruction at any level. Highly qualified teachers are those who have gained teacher certification and licensure, know their subject area, and are competent at teaching it (Darling-Hammond & Berry, 2006). Per these requirements, Roberts, Dooley, Harlin, and Murphy (2006) stated, “competency in subject matter and pedagogy is more subjective and thus more difficult to measure” (p. 1).

In Oklahoma, agricultural education majors must meet three minimal requirements to be qualified to teach. Students must obtain a bachelor’s degree, be granted full certification, and possess proficiency in the subject matter in which they are expected to teach by passing the Oklahoma Subject Area Test (OSAT) (OSU Student Handbook for Agricultural Education & Student Teaching, 2009-2010).


One of the key areas of Agricultural Power and Technology is welding. Oklahoma skills standards for welding were developed by the ODCTE. Welding skills standards pertain to the welding industry, specifically, and to the national welding industry, generally. Oklahoma welding skills standards are aligned with and endorsed by the American Welding Society (AWS). Skills standards provide a listing of necessary skills in which an individual should be proficient to be deemed competent and employable. To ensure that competencies are met, written assessments are used to evaluate student performance (ODCTE, OD46903, 2006). Skills standards provide educators with a roadmap of essential skills they should teach.

Specifically, welding is comprised of seven skills standards. These seven consist of manual arc welding, welding processes and procedures, welding knowledge, welding safety, oxy-fuel, brazing, and manual cutting (ODCTE, 2006). As such, pre-service teachers should be confident in and knowledgeable about these seven skills.
standards. Wingenbach, White, Degenhart, Pannkuk, and Kujawski (2007) stated that, Highly qualified teachers are defined in the No Child Left Behind Act of 2001 (NCLB) as those who not only possess state certification, but who also have content knowledge of the subjects they teach. In Career and Technical Education (CTE), teachers need to be competent in technical, employability, and academic skills. Additionally, high-quality CTE [Career Technical/Workforce Education] teachers are essential in helping the United States develop a 21st-century workforce that will be competitive in the world marketplace. (pp. 114-115)

Conceptually, this study was based on the human capital theory. Human capital (HC) is an investment in people’s knowledge, skills, experiences, competencies (Becker, 1964; Bernston, Sverke, & Marklund, 2006; Garavan, Morley, Bunnigle, & Collins, 2001; Little, 2003; Mincer, 1974; Schultz, 1971; Smith, 2010; Smylie, 1996). The more developed a person’s HC, the more employable that person becomes (Becker, 1975), so long as the HC is a good match, or fit, for the job in which he or she is seeking (Ballout, 2007; Caplan, 1987).

The Oklahoma Commission for Teacher Preparation (OCTP) documents professional examination scores in its program assessment report. In the section designated for OSAT scores, agricultural education pre-service teachers averaged the lowest or second to lowest examination scores in agricultural power and technology from 2002 to 2005 (Leiby, Robinson, Key, & Leising, 2011). Additionally, agricultural education pre-service teachers were most likely to receive failing scores in the area of agricultural power and technology on the OSAT. Below average certification scores, combined with the highest rate of failure in the OSAT area of agricultural power and technology, indicated a need to determine Oklahoma pre-service agricultural education teachers’ knowledge about and confidence to teach skills related to agricultural mechanics.

### Purpose of the Study

The purpose of this study was to assess the perceptions of pre-service agricultural education teachers at Oklahoma State University regarding the importance of identified welding skills standards and their confidence to teach them, based on a semester-long course on metals and welding. Further, this study sought to determine pre-service teachers’ knowledge of welding prior to and at the end of instruction. The following research objectives guided the study.

1. Compare pre-service agricultural education teachers’ perceived levels of importance to teach selected welding skill constructs prior to and at the end of instruction.
2. Compare pre-service agricultural education teachers’ perceived levels of confidence to teach selected welding skill constructs prior to and at the end of instruction.
3. Determine the relationship between pre-service agricultural education teachers’ perceived levels of confidence to teach selected welding skills standards and final course grade.
4. Determine the relationship between pre-service agricultural education teachers’ final course grade and level of work experience in welding.
5. Compare pre-service agricultural education teachers’ levels of technical knowledge in welding prior to and at the end of instruction.

### Methods

The research design employed for this study was descriptive-correlational. Descriptive statistics (i.e., modes of central tendency and variability) are helpful for summarizing trends (Ary, Jacobs, & Razavieh, 2002). Descriptive statistics assist researchers to understand better the degrees of variation in data and help define relationships among data sets (Creswell, 2008); whereas, “In correlational research designs, investigators use the correlation statistic test to describe and measure the degree of association...
(or relationship) between two or more variables or sets of scores” (p. 356).

The instrument used in this study consisted of three sections. Section one was utilized to capture pre-service teachers’ self-perceived confidence and importance ratings on the seven welding skills constructs. Section two was designed to measure the welding knowledge proficiency of pre-service teachers. Finally, section three was employed to gather personal characteristics data from the participants. Measurements of knowledge, confidence, and importance were collected prior to and at the end of instruction via survey research.

Using participants’ responses, the welding education need for pre-service agricultural education teachers was determined. The population for this study was all pre-service agricultural education teachers (N = 58) enrolled in a metals and welding course at Oklahoma State University in Fall 2009. Because this course has been taught for the past 25 years by the same instructor to essentially the same types of students, an assumption was made that these pre-service teachers were no different regarding their demographic makeup, age, work experiences, or knowledge than other pre-service teachers in recent, previous years. So, a time and place sample, as defined by Oliver and Hinkle (1982), was employed serving as justification for the researchers to use inferential statistics.

Descriptive statistics (i.e., means and standard deviations) were employed for objectives one and two. A Cohen’s $d$ statistic was used to measure the practical effect that the constructs had on students’ perceived levels of importance and confidence to teach the skills as a result of the 16-week course. Practical difference is important to assess because it informs the researcher as to whether or not the treatment effect was “large enough to be useful in real world” (Kirk, 1995, p. 64) and was interpreted as $.2 = \text{small}$, $.5 = \text{medium}$, and $.8 = \text{large}$ (Cohen, 1988).

A Pearson Product-Moment Correlation was calculated for objectives three and four. The null hypothesis for objective three stated that, in the population studied, there was no relationship between teachers’ final course grade and level of teachers’ prior work experience in welding (Ho: $p = 0$).

The instrument used for section one was developed by the researchers and consisted of 26 skills which were derived from the ODCTE, OD46903 (2006). Once developed, the instrument was reviewed by a panel of agricultural education faculty for face and content validity. Then, a pilot study was performed on a group of pre-service teachers (N = 23) who were enrolled in the course during the summer semester of 2009. Using Nunally’s (1980) minimum criteria of .70 for reliability, the pilot study results indicated that the instrument was reliable on all seven constructs, with the exception of welding safety importance. That construct had a reliability estimate of .54 (Leiby et al., 2011). However, the welding safety confidence construct had a reliability estimate of .79. Because all other constructs were above Nunally’s (1980) threshold, section one of the instrument was deemed reliable. Once administered, pre-service teachers were asked to rate how important they believed the skills standards were to teaching welding. Secondly, pre-service teachers rated how confident they were at teaching those skills.

Section two was designed to assess welding knowledge via pre-service teachers’ final course grade. As such, a criterion-referenced test was developed by the researchers. In all, 25 questions were developed for the welding knowledge test. These questions were taken directly from notes and a test bank from the instructor of record. Reliability coefficients such as a Cronbach’s alpha are not necessary for establishing reliability of criterion-referenced tests. Instead, Wiersma and Jurs (1990) listed eight factors that researchers should address to improve measurement reliability of criterion-referenced tests.

The following accommodations were made to address the suggestions of Wiersma and Jurs (1990): 1) Homogeneous items: The questions utilized in the design of the test were taken directly from course content or from an established course question bank. All material used for developing the test was cross-referenced with Oklahoma Agricultural Power and Technology and Welding Skills Standards; 2) Dis-
test questions were analyzed utilizing question difficulty and discrimination scores provided and computed by the Oklahoma State University Testing Center; 3) 3) **Enough items:** The test consisted of 25 questions on pre-service teachers’ knowledge of welding. In its entirety, the instrument contained 87 questions and was administered twice during the semester (prior to instruction and at the end of instruction). Therefore, the instrument was deemed acceptable in length; 4) **High quality copying and format:** The test was custom printed professionally by the OSU Testing Center. Sections two and three were printed using laser jet ink mass copying systems. All laser jet ink copies were reviewed, sorted, culled, and reprinted when necessary to provide clean, sharp, and readable copies. All responses were provided on commercially available scantron forms; 5) **Clear directions for the students:** Oral instructions were developed by the researcher and read aloud to participants before all survey administrations. With the assistance of whiteboard illustrations, the researcher attempted to provide examples of how to complete the test properly. The instructions were provided with the intention of minimizing the rate of student errors and any potential sources of confusion; 6) **A controlled setting:** Students were allowed time to take the test in the same location in which their laboratory experiences occurred; 7) **Motivating instructions:** In addition to receiving the oral instructions, pre-service teachers were provided with the intentions of the test and the importance of answering questions accurately and honestly; 8) **Clear directions to the scorer:** All Scantron® forms were scored and tabulated by the OSU Testing Center. For objective five, an independent samples $t$-test was run. The null hypothesis stated that, in the population studied, no statistically significant ($p > .05$) difference existed between teachers’ level of technical knowledge of welding before and after instruction (Ho: $\mu_1 = \mu_2$). This study was part of a larger body of work (Leiby et al., 2011), which revealed that those who participated in the study were predominately male (74%) and 22 years of age or older (47%). Greater than one-half (59%) of these pre-service teachers had no formal welding experience prior to enrolling in the course.

**Findings**

Objective one was to compare pre-service agricultural education teachers’ perceived levels of importance to teach selected welding skills standards prior to and at the end of instruction. Pre-service teachers experienced positive gains on all seven constructs throughout the semester (see Table 1), as detected by the low, practical effect sizes.

<table>
<thead>
<tr>
<th>Construct</th>
<th>Prior to Instruction$^a$</th>
<th>End of Instruction$^b$</th>
<th>Mean Differences$^c$</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$M$</td>
<td>$SD$</td>
<td>$M$</td>
</tr>
<tr>
<td>Manual Arc Welding</td>
<td>4.21</td>
<td>.89</td>
<td>4.39</td>
</tr>
<tr>
<td>Welding Processes and Procedures</td>
<td>4.38</td>
<td>.72</td>
<td>4.53</td>
</tr>
<tr>
<td>Welding Knowledge</td>
<td>4.37</td>
<td>.73</td>
<td>4.48</td>
</tr>
<tr>
<td>Brazing</td>
<td>4.21</td>
<td>.88</td>
<td>4.32</td>
</tr>
<tr>
<td>Welding Safety</td>
<td>4.69</td>
<td>.61</td>
<td>4.77</td>
</tr>
<tr>
<td>Oxy-fuel</td>
<td>4.62</td>
<td>.63</td>
<td>4.69</td>
</tr>
<tr>
<td>Manual Cutting</td>
<td>4.27</td>
<td>.88</td>
<td>4.34</td>
</tr>
<tr>
<td>Overall Composite Score</td>
<td>4.39</td>
<td>.76</td>
<td>4.50</td>
</tr>
</tbody>
</table>

*Note. $^a$Prior to Instruction = August; $^b$End of Instruction = December; Scale: 1 = No Importance, 2 = Below Average Importance, 3 = Average Importance, 4 = Above Average Importance, 5 = High Importance; $^c$Practical effect per Cohen’s $d$; $^* =$ small effect; ** = medium effect; *** = large effect
Specifically, it was found that the construct in which pre-service teachers experienced the greatest amount of growth from the beginning of the semester to the end was manual arc welding (\textit{Mean Difference} = +.18). Welding safety was the construct with the highest mean importance score at the beginning (\textit{M} = 4.69; \textit{SD} = .61) and end (\textit{M} = 4.77; \textit{SD} = .46) of the semester. Brazing (\textit{M} = 4.21; \textit{SD} = .88) and manual arc welding (\textit{M} = 4.21; \textit{SD} = .89) were the constructs with the lowest mean importance score prior to instruction. Brazing (\textit{M} = 4.32; \textit{SD} = .76) was the lowest mean importance score at the end of instruction for pre-service teachers (see Table 1).

Objective two was to compare pre-service agricultural education teachers’ perceived levels of confidence to teach selected welding skill constructs prior to and at the end of instruction. The construct regarding teachers’ confidence to teach with the greatest amount of growth prior to and at the end of instruction was brazing (\textit{Mean Difference} = +1.86). Welding safety was the construct with the highest mean confidence score prior to (\textit{M} = 3.86; \textit{SD} = 1.11) and at the end of instruction (\textit{M} = 4.53; \textit{SD} = .68). Brazing (\textit{M} = 2.26; \textit{SD} = 1.17) was the construct with the lowest score for confidence prior to the semester. Welding knowledge (\textit{M} = 3.90; \textit{SD} = .91) was the construct with the lowest score for confidence at the end of the semester for pre-service teachers.

Table 2
\textit{Comparison of Pre-service Teachers’ Perceptions of Confidence to Teach Selected Welding Skill Constructs Prior to and at the End of Instruction (N = 58)}

<table>
<thead>
<tr>
<th>Construct</th>
<th>Prior to Instruction$^a$</th>
<th>End of Instruction$^b$</th>
<th>Mean Differences$^c$</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>\textit{M}</td>
<td>\textit{SD}</td>
<td>\textit{M}</td>
</tr>
<tr>
<td>Brazing</td>
<td>2.26</td>
<td>1.17</td>
<td>4.12</td>
</tr>
<tr>
<td>Manual Arc Welding</td>
<td>2.55</td>
<td>1.29</td>
<td>4.03</td>
</tr>
<tr>
<td>Oxy-fuel</td>
<td>2.84</td>
<td>1.39</td>
<td>4.28</td>
</tr>
<tr>
<td>Manual Cutting</td>
<td>2.60</td>
<td>1.35</td>
<td>3.96</td>
</tr>
<tr>
<td>Welding Knowledge</td>
<td>2.63</td>
<td>1.26</td>
<td>3.90</td>
</tr>
<tr>
<td>Welding Processes and Procedures</td>
<td>2.98</td>
<td>1.31</td>
<td>4.05</td>
</tr>
<tr>
<td>Welding Safety</td>
<td>3.86</td>
<td>1.11</td>
<td>4.53</td>
</tr>
<tr>
<td>Overall Composite Score</td>
<td>2.82</td>
<td>1.26</td>
<td>4.12</td>
</tr>
</tbody>
</table>

\textit{Note.} $^a$Prior to Instruction = August; $^b$End of Instruction = December; Scale: 1 = No Importance, 2 = Below Average Importance, 3 = Average Importance, 4 = Above Average Importance, 5 = High Importance; $^c$Practical effect per Cohen’s \(d\); * = small effect; ** = medium effect; *** = large effect

A large, practical effect was noticed for six of the seven constructs measured regarding confidence (brazing, manual arc welding, oxy-fuel cutting, manual cutting, welding knowledge, and welding processes procedures). Welding safety had a medium, practical effect on students’ confidence as a result of the course (see Table 2). Overall, a large effect (+1.30) was detected regarding students’ perceptions of their confidence to teach these welding constructs as a result of the 16-week course.

Objective three was to determine the relationship between pre-service agricultural education teachers’ perceived levels of confidence to teach selected welding skill constructs prior to and at the end of instruction. All pre-service teachers’ end-of-instruction responses regarding confidence were averaged to create an individual mean confidence measurement for each teacher in the study. Individual confidence means were then averaged to create a confidence grand mean score for pre-service teachers in the study. Also pre-service teachers’ end-of-instruction course scores were recorded, transposed, and averaged to create a final course grade mean score (see Table 3).
Table 3
The Relationship between Teachers’ Confidence to Teach Welding at the End of the Semester and their Final Course Grade

<table>
<thead>
<tr>
<th>Pre-service Teachers’ Confidence</th>
<th>Final Course Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grand Mean Score</td>
<td>Mean Score</td>
</tr>
<tr>
<td>4.11</td>
<td>78.07</td>
</tr>
</tbody>
</table>

*Note. p = < .05; df = 56, Scale: 1 = No Confidence, 2 = Below Average Confidence, 3 = Average Confidence, 4 = Above Average Confidence, 5 = High Confidence

When correlating teacher confidence and final course grade, the r-value was .29, indicating a positive, low relationship (Davis, 1971). The p-value was .03, indicating that there was a statistically significant relationship between the confidence measurement and final course grade of pre-service teachers (see Table 3). Therefore, the null hypothesis was rejected.

Objective four sought to determine the relationship between pre-service agricultural education teachers’ final course grade and level of previous work experience in welding. It was found that there was no statistically significant relationship (p = 0) between previous work experience in welding and pre-service teachers’ final course grade (see Table 4). Thus, the null hypothesis was accepted.

Table 4
Relationship among Pre-service Teachers’ Final Course Grade and Previous Work Experience

<table>
<thead>
<tr>
<th>Variable</th>
<th>Previous Work Experience in Welding</th>
</tr>
</thead>
<tbody>
<tr>
<td>Final Course Grade</td>
<td>0.19</td>
</tr>
</tbody>
</table>

Objective five was to compare pre-service agricultural education teachers’ levels of technical knowledge in welding prior to and at the end of instruction. On the 100-point, criterion-referenced examination, students averaged a score of 58.41 (SD = 13.42) prior to instruction (see Table 5). On the same examination, students averaged a score of 70.21 (SD = 13.43) at the end of instruction. Students’ mean knowledge scores increased nearly 12 percent (11.8%) throughout the semester. Standard deviations remained nearly constant (SD = 13.42 prior to instruction; SD = 13.43 end of instruction). However, students’ minimum and maximum scores increased by 12 percent on measures taken prior to and at the end of instruction, respectively. Pre-service teachers demonstrated a statistically significant increase in welding technical knowledge (p = .00) at the end of instruction when compared to their scores prior to instruction. This change resulted in a large effect size (Cohen, 1988). Therefore, the null hypothesis was rejected in favor of the alternative hypothesis, indicating that there was a statistically significant difference in mean scores prior to and at the end of instruction (p = < .05).

Table 5
Pre-service Teachers’ Level of Technical Knowledge in Welding Prior to and at the End of Instruction

<table>
<thead>
<tr>
<th>Variable</th>
<th>Range</th>
<th>p-value</th>
<th>Cohen’s d</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prior to Instruction</td>
<td>Min. % 28</td>
<td>.00*</td>
<td>.89</td>
</tr>
<tr>
<td>End of Instruction</td>
<td>Max. % 84</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>M 58.41</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>SD 13.42</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Min. % 40</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Max. % 96</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>M 70.21</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>SD 13.43</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. Range = a0 to 100%; b0 to 100%; p = < .05
Conclusions

Pre-service teachers perceived positive levels in the importance of and their confidence to teach all seven welding constructs as a result of the 16-week course. Ratings showed small, practical differences regarding the importance of the welding constructs as a result of the semester-long course, with mean differences ranging from +.07 to +.18. However, confidence scores showed large practical effects, with ratings ranging from +.67 to +1.86. As a result, the course had a small, practical effect on students’ perceptions of the importance of the welding constructs and a large practical effect on their confidence to teach the constructs.

Regarding confidence, pre-service teachers began the semester ranging between below and average confidence on the seven welding constructs. However, by the end of the semester, teachers were above average in their confidence levels to teach the constructs. What is more, the course had a large practical effect on students’ confidence to teach them. In a teacher preparation program, this finding is encouraging because confidence can lead to mastery (Bandura, 1997)—in this case, teaching agricultural mechanics effectively.

Pre-service teachers placed a high amount of importance on welding safety both prior to and at the end of instruction. Safety precautions should always be considered, regardless of the sector of the agricultural industry in which an individual works (Slusher, Robinson, & Edwards, 2011). As such, it was encouraging to see that these individuals recognized the importance of safety, especially in a laboratory setting where danger is present constantly. The need to be attentive to safety specific to agricultural mechanics laboratories has been documented well in the literature (McKim & Saucier, 2011; Saucier, McKim, & Tummons, 2012; Saucier, McKim, Murphy, & Terry, Jr., 2010; Saucier, Terry, Jr., & Schumacher, 2009).

Pre-service teachers rated the importance of all constructs higher than their confidence to teach them. Further, when comparing overall composite means, the importance composite score was higher than the confidence composite score. This finding supports previous research by Radhakrishna and Bruening (1994) and Robinson et al. (2007) who concluded that graduates tended to rate items higher on importance than their self-perceived competence to perform them.

No statistically significant relationship existed between pre-service teachers’ prior work experiences in welding and their grade in the course. This finding contradicts Bandura’s (1997) assertion that experiences lead to mastery and competency.

The course resulted in pre-service teachers obtaining above average confidence in teaching the seven welding constructs. Further, the course had a statistically significant effect on students’ knowledge of welding. This resulted in a large effect size, and enabled pre-service teachers to advance their knowledge in welding from a failing grade at the beginning of the semester, to a grade of C at the end of the semester—a 12% increase. This finding supports Bandura’s (1997) notions that confidence improves with performance. In addition, it implies that these pre-service teachers were beginning to master their knowledge in welding toward the end of the semester, which is another important source of developing self-efficacy (Bandura, 1997).

Recommendations for Future Research

This study focused on pre-service teachers’ abilities to teach constructs devoted to welding, with a particular focus in hot metal work. However, agricultural mechanics is much more diverse than being solely about welding. Therefore, future studies should be conducted on additional areas of agricultural mechanics curriculum, such as concrete, plumbing, electricity, and small gas engines, to determine pre-service teachers’ regard for their importance in the secondary classroom as well as their level of confidence to teach them effectively.

Further research also should assess the impact this course will have on these pre-service teachers long term. For instance, are students who took the course prepared better in agricultural mechanics versus those who did not? Does this preparation lead to more effective teaching in the agricultural mechanics laboratory and, in turn, affect these future teachers’ students positively? Specifically, are secondary
students whose teachers participated in this course more proficient at performing agricultural mechanics competencies on end-of-instruction examinations than those who did not? Follow-up studies should be conducted.

This study revealed that these pre-service teachers’ confidence and knowledge in welding increased as a result of the course. However, it is not certain that these teachers have mastered the art of teaching welding. Therefore, a longitudinal study should be conducted to determine if and when these teachers develop the human capital necessary to fully master the welding skills needed to be an effective teacher in the classroom and laboratory settings (Bandura, 1997; Knobloch & Whittington, 2002). Because mastery experience is the most effective way of creating self-efficacy (Bandura, 1997), it would be important to determine if the pre-service teachers who had higher confidence and knowledge scores in this study are able to assist their students in achieving higher end-of-the-year, state-mandated examination scores, as opposed to the students of teachers who had lower confidence and knowledge scores.

Regarding safety, it was found to be the highest rated construct prior to instruction. Because of its high initial rating by pre-service teachers at the beginning of the semester, it was the construct that experienced the least amount of growth when comparing teachers’ confidence to teach the constructs at the end of the semester. However, indicating an appreciation for safety and actually practicing safety are two different perspectives. Therefore, follow-up studies should include attempts to determine if teachers are able to teach and practice safety effectively with secondary agriculture students once they enter the teaching profession.

**Recommendations for Practice**

Pre-service teachers rated welding knowledge and manual cutting as the lowest mean score constructs. Because developing human capital is largely contingent on knowledge acquisition (Schultz, 1961), additional emphasis on these areas should be offered to pre-service teachers. Specifically, at Oklahoma State University, opportunities exist for faculty to offer one-credit hour weekend courses throughout the fall and spring semesters. To that end, teacher educators at OSU should consider offering additional coursework to pre-service teachers regarding welding knowledge and manual cutting. Additionally, the findings of this study should be applied to in-service teachers as well. Because this study employed a time and place sample (Oliver & Hinkle, 1982), it can be assumed that former pre-service teachers who are now in-service teachers received the same training and preparation and likely have the same needs regarding agricultural mechanics. As such, professional development should exist in the way of welding knowledge and manual cutting.

Because agricultural education exists to prepare students for college and careers, simultaneously (Roberts & Ball, 2009), further discussions need to exist with in-service teachers regarding employment possibilities for high school graduates in the welding sector of the agricultural mechanics industry. Understanding the opportunities that exist could encourage teachers to develop expertise in the areas identified in this study. Helping teachers realize the numerous career opportunities available in welding and agricultural mechanics has implications for building a sufficient workforce in the 21st Century, which corresponds with priority number five of the National Research Agenda (Doerrfelt, 2011).

Because there was a statistically significant relationship between pre-service teachers’ confidence to teach welding skills and their final course grade, it is recommended that the course continue allowing student experiences that increase their human capital in welding. Perhaps these students could work in groups or teams to receive additional observation and modeling regarding effective welding practices. Bandura (1997) noted the impact vicarious learning can have on an individual’s level of self-efficacy. So, perhaps students’ levels of self-efficacy would elevate higher if they worked in teams to achieve these tasks. Specifically, because all seven welding constructs were rated above average on importance by pre-service teachers both prior to and at the end of instruction, the instructor of record for this course should continue to teach each one of them.
Finally, performing welding skills as a student and teaching them as an instructor are two separate issues. In other words, just because human capital was acquired as a result of this course does not mean that it will be sustained and practiced in the field when these pre-service teachers enter the profession. Because these pre-service teachers were not full-time teachers, caution is issued with making wholesale changes to the curriculum or generalizing the results of this study to the larger profession. To determine if these participants can teach these skills, microlessons should be developed and microteachings should be conducted and scored by university supervisors in pre-service teaching methods courses.

Implications

At the end of the semester, pre-service teachers had above average confidence in teaching the seven welding constructs measured in this study. Yet, their final grade in the class was barely passing (C) and a low, positive relationship existed. What does this finding mean? Could it be that these pre-service teachers overestimated their abilities to master these constructs? Knobloch and Whittington (2003) stated that student teachers tend to be overly confident in their abilities to teach in the classroom. Further, it is also possible that the reason students’ course grade and mean confidence score experienced a low, positive relationship was due to the fact that students might see their educational courses as a mere checklist of criteria that has to be completed to earn a degree instead of realizing the value these courses will have on their career readiness long term. Said another way, perhaps some students see education as a series of hurdles to clear prior to entering the workforce and not as an opportunity to invest in their human capital, which will lead to employability. Therefore, it is possible that the reason students have elevated confidence but lower test scores is due to not taking their coursework seriously. These students should be reminded that, according to principals, the most important factor of human capital when employing an entry-level agriculture teacher in Oklahoma is academic rigor (Robinson & Baker, 2012).

It is concerning that the lowest rated construct score for confidence at the end of the semester was welding knowledge. How can students be more confident in teaching all other constructs related to welding knowledge, yet score the actual welding knowledge construct lowest by comparison? What does this mean about the pedagogy offered in the course? Perhaps students understand the skills needed to perform certain skills, like brazing; however, they fail to recognize how to synthesize these skills into a format conducive to teaching and learning. An example of skills listed under the welding knowledge construct are: selecting and using shielded gas, identifying major parts of gas metal arc (MIG) welding, and identifying welding errors. Implications exist for teacher educators to help pre-service teachers understand the basics of agricultural mechanics curriculum from a teaching and learning standpoint. These students need assistance in critiquing their own work and making decisions for why they choose one piece of equipment over another.

This study revealed that prior work experience did not affect teachers’ confidence in welding. This finding is concerning considering the fact that experience is a core tenant of human capital (Becker, 1964; Schultz, 1971). It would seem that students with experience in welding would be more confident in their ability than those who had no experience. Perhaps the type of experience students received was not positive or was miseducational in nature. Unlearning bad habits can be time consuming and difficult. As such, current agricultural education teachers should monitor the instruction being offered in secondary agricultural mechanics courses to ensure that students receive positive experiences in welding.

References


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BRIAN L. LEIBY is a Secondary Agriculture Teacher at Marionville, MO, PO Box 409, Marionville, MO 65705, bleiby@marionville.k12.mo.us

J. SHANE ROBINSON is an Associate Professor of Agricultural Education in the Department of Agricultural Education, Communications and Leadership at Oklahoma State University, 457 Agricultural Hall, Stillwater, OK 74078-6032, shane.robinson@okstate.edu

JAMES P. KEY is a Professor of Agricultural Education in the Department of Agricultural Education, Communications and Leadership at Oklahoma State University, 451 Agricultural Hall, Stillwater, OK 74078-6032, james.key@okstate.edu
Variable Relationships Affecting Agriscience Teachers’ Stages of Concern for Content Area Reading Strategies

Anna J. Warner
Carroll County Schools
Brian E. Myers
University of Florida

In spite of national initiatives such as the No Child Left Behind Act of 2001, American students continue to be struggling readers. Research on content area reading strategies (CARS) has shown that such strategies increase students’ ability to read and comprehend text. The purpose of this research was to assess agricultural educators’ implementation of content area reading strategies in their classroom. A tailored-design, web-based questionnaire was distributed to 371 Florida agriscience educators to complete this descriptive, census survey. The results indicated the total number of hours of CARS professional development was not related to progression through the stages of concern. This study also underscored the lack of consistency in the professional development programs these teachers completed. In order to better understand the differences of the professional development programs, research should be conducted to determine the characteristics of various CARS professional development programs. Practitioners should provide a consistent, in depth professional development program to provide ongoing training and support throughout a several year process.

Keywords: Reading strategies; teacher professional development; academic integration; Stages of Concern; Content Area Reading

The U.S. Department of Education [USDE] has reported over eight million struggling readers in the United States between fourth and twelfth grade (2003). Additionally, for over 20 years, math achievement and SAT scores have been increasing while verbal scores have remained stable or declined slightly (College Board, 2002; USDE, 2008). When comparing international reading proficiency, U.S. students have ranked toward the bottom, even below students from developing countries (Snow, 2002). These statistics have prompted a number of state and national reading initiatives. In an attempt to provide higher quality education to America’s students, the No Child Left Behind (NCLB) Act has mandated a major change across the nation in education, with a large section of the NCLB Act focused on improving student literacy. However, a NCLB accountability report, published by the USDE, highlighted continuing literacy problems in spite of the earlier call for improvement. Only about 30% of fourth and eighth grade students performed at the proficient reading level, with students of low socioeconomic status and different ethnicities performing much lower. Two percent of the same students performed below basic levels (Mapping America’s Educational Progress, 2008). Since 2002, students have made steady improvements in math scores. However, fourth graders have improved their reading scores minimally and eighth graders’ reading scores have slightly declined. The Mapping Florida’s Progress 2008 report shows that Florida’s students rank below the national average for reading achievement.

Park (2008), in notes from a roundtable discussion at the National Agricultural Education Inservice regarding literacy in agricultural education, emphasized the unique ability agri-
science teachers possess to facilitate content area reading in students who are motivated to learn the content. If agriscience teachers purposefully introduce reading strategies into instruction, these teachers have the ability to increase student reading motivation and comprehension. These experiences provide students with opportunities to learn lifelong literacy skills and engage students in the content (Park, 2008; Fisher & Ivey, 2005). However, historically, agriscience teachers have been the most resistant group of educators to the adoption and implementation of Content Area Reading Strategies [CARS]. O’Brien and Stewart (1990) found that of the pre-service content area teachers included in their study, agricultural educators nationally were the most opposed to classroom reading implementation. Eighty-five percent of the pre-service agricultural educators rejected content area reading (O’Brien & Stewart). More recently, Park and Osborne (2006a) identified teachers’ lack of knowledge and confidence in CARS implementation as the main obstacles to incorporating reading into agricultural education programs with agriscience teachers unable identify specific CARS to implement in their curricula (Park and Osborne, 2006b).

Successful implementation and continuation of CARS instruction relies on prolonged professional development and support for teachers (Vacca, 2002a; Vacca 2002b). A school-wide effort for CARS professional development relying on proper organization, leadership, scheduling, and development is needed (Meltzer, 2001). Meltzer noted the need for continuing cycles of “(1) examining the outcomes, (2) reviewing and improving program components, (3) seeking practical feedback, and (4) implementing improvements” to ensure successful professional development support for CARS (p.7).

Educators, politicians, and parents have investigated how to improve student performance in all areas of education, especially literacy. School systems have invested time and money in teacher CARS professional development. Park and Osborne (2006b) stated the need to research the effectiveness of CARS professional development programs and the utilization of CARS in agriscience. An objective evaluation of the success of teacher professional development programs in content area reading in agriscience is needed to validate the continuation of these programs. In order to evaluate the success of an innovation, documentation of implementation must be achieved (Hall & Hord, 2006). Have teachers who have completed CARS professional development programs implemented CARS into the classrooms? The problem under investigation in this study was, what factors have influenced agriscience teachers’ implementation of CARS instruction?

**Literature Review/Theoretical Framework**

The Concerns-Based Adoption Model [CBAM] (Hall & Hord, 2006) (Figure 1) was chosen as the theoretical base of this study for three reasons: 1) it is based on 35 years of research focused on educational change, 2) it has been extended and tested in different settings, and 3) it is recognized as one of the strongest models for educational change (Hall & Hord; Anderson, 1997). This research-based model is designed to facilitate change and provide a diagnostic method to measuring implementation of an innovation (Hall & Hord). The model consists of the environment, the user system culture, resource system, change facilitator team, interventions, users and nonusers, and three diagnostic measures: stages of concern, levels of use, and innovation configurations (Hall & Hord).

Stages of Concern [SoC] is a diagnostic component which addresses the affective side of change (Hall & Hord, 2006). The feelings and perceptions of participants are known as concerns. The SoC was developed based upon research on the evolution of concerns throughout the change process and depict a progression of concerns through which people move during the implementation process. Knowing teachers’ concerns can help judge implementation of change or can be used to develop focused workshops, provide individual coaching, and create strategic plans to more effectively facilitate change.

Based on Fuller’s (1969) identification of concerns, Hall and Hord (2006) have developed seven Stages of Concern. George, Hall, and Stiegelbauer (2006) offered the following definitions for each of the Stages of Concern:
0 Awareness: Little concern about or involvement with the innovation is indicated.
1 Informational: A general awareness of the innovation and interest in learning more detail about it is indicated.
2 Personal: [The] individual is uncertain about the demands of the innovation, his/her inadequacy to meet those demands, and his/her role with the innovation.
3 Management: Attention is focused on the processes and tasks of using the innovation and the best use of information and resources.
4 Consequences: Attention focuses on impact of the innovation on clients in his or her immediate sphere of influence.
5 Collaboration: The focus is on coordination and cooperation with others regarding use of the innovation.
6 Refocusing: The focus is on the exploration of more universal benefits from the innovation, including the possibility of major changes or replacement with a more powerful alternative.

Research has shown “there is a quasi-development path to the concerns as the change process unfolds” (Hall & Hord, 2006, p. 141). Although, they stated that neither the progression of concerns nor the direction of the progression is guaranteed. When proper conditions exist (i.e. appropriateness of change, proper involvement from leaders, and effective facilitation) participants move from Stages 1 & 2 to Stage 3 during the first couple years, and ideally they will move to Stages 4 & 5 around three to five years into implementation. Undesirable conditions can cause participants to cease progression or regress. Hall and Hord (2006) highlighted, SoC “reflect the idealized, developmental approach to change” (p. 142). Anderson (1997) explains, “CBAM theory idealizes the Stages of Concern as a developmental progression in which teachers implementing a change have concerns of varying intensity across all seven stages at different points in the change process” (p. 334). However, teacher concern may not progress through all stages in the suggested order.

Based upon a thorough literature review, the researchers identified the conceptual framework variables and created a conceptual model pictured in Figure 1. The conceptual model depicts the internal and external variables related to agriscience teachers’ concerns regarding the implementation of content area reading strategies.

Figure 1. Conceptual model
The researchers identified teacher attitudes, confidence, knowledge and experience, motivation, perceptions and conceptions, and teaching philosophy as internal variables for CARS implementation. Park and Osborne (2006a) studied agriscience teachers’ attitudes concerning CARS and identified motivation, pressures, and barriers related to CARS implementation. Teachers were motivated to use CARS so students could establish background information. Pressures included the diversity of students and their reading abilities and the documentation of reading for administrators. Park and Osborne’s findings identified that although teachers had a fundamental knowledge of CARS, several barriers concerning teachers’ knowledge and confidence existed. However, the researchers found that positive teacher attitudes could also be passed to the students.

Teacher confidence and comfort with the innovation played a substantial role in implementation of information and communication technologies (Granger, Morbey, Lotherington, Owston, & Wideman, 2002). Park and Osborne (2004) acknowledged a lack of confidence in agriscience teachers’ ability to use CARS and highlighted their lack of practice with CARS as a cause. Park and Osborne (2006a) identified a lack of confidence in utilization and lack of knowledge on the proper use of CARS as major implementation barriers.

In exploring agricultural educators’ motivation to utilize CARS, Park and Osborne (2006a) found that no teachers “consciously implemented reading or CARS” (p. 43). They utilized reading assignments and corresponding questions as a way to establish baseline information or for substitute plans. Some of the participants did understand the importance of CARS. However, when participants knew they were in a study, teachers in a comparison group of a CARS study implemented twice the strategies as teachers in the treatment group (Park & Osborne, 2004). Park and Osborne (2004) concluded “with proper motivation, agriscience teachers may be willing to alter their preferred teaching methods and adopt new CARS.”

Content teachers, including agriscience teachers, realized the importance of teaching specific comprehension skills for the content area (Bryant, Ugel, Thompson, Hamff, & Hougen, 2001; Park & Osborne, 2006b). Agriscience teachers believed reading was important for learning in agriscience, yet many teachers fail to assign individual texts to students which may “hinder reading development” (Park & Osborne, 2006b, p. 11). Park and Osborne recommend using trade journals and electronic texts in the agriscience classroom. They also suggested teachers focus more efforts on activities during the pre- and during-reading periods, model reading, and incorporate CARS into classroom instruction.

From the literature, the researchers identified discipline, mandates, professional development, and social context as external variables for CARS implementation. Aneke and Finch (1997) found no significant difference when comparing SoC based on vocational and academic teaching areas; however, they did not make comparisons within specific disciplines. Conversely, Bean (1997) found that preservice teachers’ judgment of what CARS worked well for the discipline was a factor when selecting CARS. Moje (1996) found that students did not transfer CARS to other classrooms. She supported teaching domain specific content literacy methods in each discipline, so students develop social practices and knowledge necessary to apply them to that specific domain.

Park and Osborne (2004) found that agriscience teachers wanted additional professional development in CARS which addressed “where, how and why to use CARS in their agriscience courses” (p. 138-139). The teachers understood they needed further professional development and time to effectively incorporate CARS. Park suggested providing an opportunity for teachers to practice using and teaching the strategies during professional development.
Purpose and Objectives

The purpose of this research was to assess agricultural educators’ implementation of content area reading strategies (CARS) in their classrooms. In order to meet the purpose of this study, the following objectives were investigated:

1. Determine the relationship between CARS professional development and the Stages of Concern of agriscience teachers.
2. Determine the relationship between CARS conceptual variables (age, involvement with other innovations, frequency of incorporation, gender, length of involvement, teaching experience, perceived level of expertise, & relationship with reading coach) and agriscience teachers’ primary Stage of Concern.

Methodology

A descriptive census survey design was used in this study. The researcher used a web-based questionnaire to collect the Stages of Concern and contributing variables of Florida agriscience teachers towards the implementation of content area reading strategies (CARS). The population for this study was Florida agriscience teachers. The researcher obtained a list of current Florida agriscience teachers (N = 371) from the 2008 Florida Agricultural Education Directory which served as the population frame (Myers & Warner, 2008). The 2008 Florida Agricultural Education Directory was chosen as the population frame because it functioned as the only updated, comprehensive list of Florida agriscience teachers in the state at the time of this study (fall 2008) and thus was the best possible control of frame error. Two hundred fourteen questionnaires were completed for an overall response rate of 57.7% (n = 214).

The researcher utilized the Stages of Concern Questionnaire (SoCQ) developed by George et al. (2006). The Stages of Concern Questionnaire (SoCQ) is the most rigorous and reliable form of SoC assessment (Hall & Hord, 2006). This questionnaire is composed of 35 Likert-type questions that assess the concerns of the individuals involved in the educational innovation change process – in this case the integration of Content Area Reading Strategies (CARS). This questionnaire allows respondents to indicate the relevance and intensity of their concerns towards CARS. In addition to the Likert questions, a free-response question was included to allow participants to express their concerns in their own words, as recommended by Hall and Hord (2006) and G. Hall, personal communication (2008).

In addition to the SoCQ, the researcher included several questions to determine the CARS professional development history of the teachers. Teachers were asked to indicate whether they had completed different levels of training, give the numbers of hours spent in each type of training, and provide a brief description of the training. Lastly, demographic questions were included to better understand the population and to assess the conceptual variables identified.

Upon IRB approval, the researcher proceeded with the survey guided by the Tailored Design Method (Dillman, 2007) for survey collection. Descriptive statistics, including frequencies and central tendencies, and correlational statistics were used to analyze the concerns of agriscience teachers towards CARS. Additionally, the SOCQ-075 Graph and Print program was used to create an overall concerns profile for the group (Scott & Persichitte, 2006).

Dillman (2007) recommended addressing nonresponse error in all survey-based research studies because the potential for this type of error exists in all survey research. Since it would be challenging to address the Stage of Concern variable in a brief phone survey with nonrespondents, concern profiles were created for early respondents and late respondents. Ary, Jacobs, Razavieh, and Sorensen, (2006) stated that research has shown that similarities usually exist between late respondents and nonrespondents. Pace (1939) found that nonrespondents and late respondents are similar. These similarities allow for researchers to estimate the responses of nonrespondents based upon late respondents. Thus, early and late respondents were compared to address nonresponse error. Early respondents (n = 66) were defined as the participants who responded to the cover letter with the first link to the survey, before the reminder e-mail was sent.
Late respondents \((n = 42)\) were defined as participants who responded after the final contact was made. Concern profiles for both groups were non-user profiles showing resistance to change. Due to the similarity of the profiles, no significant difference between respondents and nonrespondents, in this population, is expected.

**Findings**

Of the respondents, 55.6\% \((n = 85)\) were male and 44.4\% \((n = 68)\) were female. The age range with the greatest number of participants was 51-60 with 29.4 \% (Table 1). The age range with the least amount of participants was >60 with 5.9\%.

<table>
<thead>
<tr>
<th>Age Range</th>
<th>(f)</th>
<th>(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>51-60</td>
<td>45</td>
<td>29.4</td>
</tr>
<tr>
<td>21-30</td>
<td>38</td>
<td>24.8</td>
</tr>
<tr>
<td>41-50</td>
<td>33</td>
<td>21.6</td>
</tr>
<tr>
<td>31-40</td>
<td>28</td>
<td>18.3</td>
</tr>
<tr>
<td>&gt; 60</td>
<td>9</td>
<td>5.9</td>
</tr>
</tbody>
</table>

*Note. \(f\)=frequency.*

Teachers reported their number of years teaching to be between 0 and 40 with a mean of 15.2 years. Teachers were asked if they have taught any subjects in addition to agriculture, 53.2\% \((n = 82)\) responded yes, while 46.8\% \((n = 72)\) responded no. Teachers were asked how long they have been involved with content area reading strategies, not counting this year. Of the responses, 48.4\% \((n = 74)\) responded they had never been involved with the innovation and 15.7\% \((n = 24)\) responded they have been involved for five or more years.

When asked at which level of expertise the participant considered himself/herself to be, over 60\% of the participants considered themselves to be non-users or novice users. Almost 40\% considered themselves intermediate users or old hands. None of the respondents considered themselves to be a past user of the innovation (Table 2).

<table>
<thead>
<tr>
<th>Perception</th>
<th>(f)</th>
<th>(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-user</td>
<td>51</td>
<td>33.3</td>
</tr>
<tr>
<td>Novice</td>
<td>45</td>
<td>29.4</td>
</tr>
<tr>
<td>Intermediate</td>
<td>43</td>
<td>28.1</td>
</tr>
<tr>
<td>Old hand</td>
<td>14</td>
<td>9.2</td>
</tr>
<tr>
<td>Past user</td>
<td>0</td>
<td>0.0</td>
</tr>
</tbody>
</table>

*Note. \(f\)=frequency.*

Participants were asked how often they have been incorporating CARS into their lesson. Respondents indicated 16.3\% \((n = 24)\) incorporated CARS 3-4 times a week. A third of the respondents \((n = 49)\) reported incorporating CARS \(< 1\) per month. Concern profiles were developed based on teachers’ frequency of use of CARS (Figure 2). Each of these profiles were nonuser profiles with a slight negative one-two split. According to concern profile interpretation guidelines provided by George et al. (2006), the negative one-two split occurs when personal concerns are higher than informational concerns. This indicated that teachers were more concerned about how the use of CARS would affect their position and job security than they were about learning more about the concern. Teachers with a negative one-two split may demonstrate resistance to the change. Their personal concerns need to be addressed for them to continue to progress through implementation. Weekly and monthly users had slightly higher intensity concerns than seldom and nonusers.
The major difference in these three profiles, was the direction of the tail of the graph at Stage 6. The weekly users score for Stage 6 was the same as their score for Stage 5, thus the profile neither tailed up or down. Monthly users had only a slight tailing-up of three points, which indicated that they have other ideas which may be competing with the innovation, but these ideas have not caused much resistance to the innovation (George et al. 2006). Seldom and nonusers have a tailing-up of 9 points. This indicated a resistance to the implementation of CARS.

Participants were asked to rate their working relationship with the reading coach from their school. One-third of respondents indicated they had a weak or very weak relationship with the reading coach. Only about 26% (n = 39) of respondents considered their relationship to be strong or very strong, but two-thirds rated their relationship average or higher.

Participants were asked if they have been currently involved in the first or second year of another major innovation or program. In response to this question, 55.6% (n = 85) of the respondents indicated they were involved in the first or second year of another major innovation and 44.4% (n = 68) of the respondents indicated they were not involved in the first or second year of another major innovation. These innovations focused on incorporating reading, science, math, technology, active learning strategies, and differentiated instruction in the classroom.

The teachers were asked what they believed to be the biggest barriers to CARS implementation in their school (Table 3). Of the respondents, 5.4% (n = 6) were unsure what barriers existed. The number one barrier identified by the respondents was time (33.9%; n = 38).

### Table 3

**Teacher perceived barriers to school-wide CARS implementation (n = 92)**

<table>
<thead>
<tr>
<th>Barrier</th>
<th>f</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time</td>
<td>38</td>
<td>41.3</td>
</tr>
<tr>
<td>None</td>
<td>15</td>
<td>16.3</td>
</tr>
<tr>
<td>Other demands</td>
<td>10</td>
<td>10.9</td>
</tr>
<tr>
<td>Training needs</td>
<td>8</td>
<td>8.7</td>
</tr>
<tr>
<td>Unsure</td>
<td>6</td>
<td>6.5</td>
</tr>
<tr>
<td>Planning and preparation</td>
<td>5</td>
<td>5.4</td>
</tr>
<tr>
<td>Materials/resources</td>
<td>4</td>
<td>4.3</td>
</tr>
<tr>
<td>Student interest and motivation</td>
<td>4</td>
<td>4.3</td>
</tr>
</tbody>
</table>

*Note. f= frequency. % = > 100 due to teachers identifying multiple barriers.*
Stages of Concern profiles were developed based on the number of professional development hours completed (Figures 3-5). Overall, a general pattern did not emerge from the profiles based on the amount of professional development they received. Each profile was characterized by a high relative intensity (88-99) in Stage 0, Awareness, with the exception of teachers with 81-90 hours of professional development. Of the 14 profiles developed, between 1 and >130 hours of professional development, 9 of them tail-up. The tailing-up indicates that teachers have other ideas which compete with the innovation (George et al. 2006). From the 9 profiles which tail-up, 6 of them increase more than 10 percentile points. Some of the profiles identified strong peaks, such as those with 61-70 hours of research in management and those with >130 hours in collaboration. According to standards set by George et al., all profiles for all levels of professional development were classified nonuser profiles.

Figure 3. Group concerns profiles for teachers with 0-40 hours of CARS professional development.

Figure 4. Group concerns profile for teachers with 41-90 hours of CARS professional development.
George et al. (2006) suggested analyzing the primary Stage of Concern of participants. Frequencies were calculated on the primary Stage of Concern for participants (Table 4). The majority of participants’ (51.3%, \( n = 96 \)) primary Stage of Concern was in the awareness stage, Stage 0.

Table 4
Primary Stage of Concern frequencies (\( n = 187 \))

<table>
<thead>
<tr>
<th>Primary Stage of Concern</th>
<th>( f )</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stage 0 – Awareness</td>
<td>96</td>
<td>51.3</td>
</tr>
<tr>
<td>Stage 2 – Personal</td>
<td>29</td>
<td>15.5</td>
</tr>
<tr>
<td>Stage 3 – Management</td>
<td>28</td>
<td>15.0</td>
</tr>
<tr>
<td>Stage 1 – Informational</td>
<td>23</td>
<td>12.3</td>
</tr>
<tr>
<td>Stage 5 – Collaboration</td>
<td>7</td>
<td>3.7</td>
</tr>
<tr>
<td>Stage 6 – Refocusing</td>
<td>4</td>
<td>1.9</td>
</tr>
<tr>
<td>Stage 4 – Consequences</td>
<td>0</td>
<td>0.0</td>
</tr>
</tbody>
</table>

*Note. \( f \) = frequency.*

Correlations were calculated to determine the magnitude and direction of the relationship between conceptual variables and the primary Stage of Concern. Correlations between variables with ordinal data were calculated using Spearman’s \( \rho \) (Table 5). All of the correlations were determined to be positive with the exception of frequency of incorporating CARS, past teaching experiences, and current involvement in other innovations which were determined to be negative correlations.

Teachers perceived level of expertise had a moderate correlation coefficient above 0.30. Frequency of incorporating CARS and relationship with the reading coach had low correlation coefficients between 0.10 and 0.29. Current involvement in other innovations, number of years teaching, and gender had negligible correlation coefficients between 0.01 and 0.09.
Table 5

Spearman’s rho correlation coefficient between demographic variables and primary Stage of Concern

<table>
<thead>
<tr>
<th>Demographic</th>
<th>n</th>
<th>r</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceived level of expertise</td>
<td>153</td>
<td>.30</td>
</tr>
<tr>
<td>Frequency of incorporating CARS</td>
<td>147</td>
<td>-.29</td>
</tr>
<tr>
<td>Length of involvement with CARS</td>
<td>153</td>
<td>.26</td>
</tr>
<tr>
<td>Relationship with reading coach</td>
<td>144</td>
<td>.20</td>
</tr>
<tr>
<td>Age</td>
<td>153</td>
<td>.18</td>
</tr>
<tr>
<td>Past teaching experiences</td>
<td>154</td>
<td>-.14</td>
</tr>
<tr>
<td>Current involvement in other innovations¹</td>
<td>148</td>
<td>-.09</td>
</tr>
<tr>
<td>Number of years teaching</td>
<td>152</td>
<td>.09</td>
</tr>
<tr>
<td>Gender²</td>
<td>153</td>
<td>.07</td>
</tr>
</tbody>
</table>

¹ Coded: 1 = involved in other innovations; 2 = not involved in other innovations
² Coded: 1 = male; 2 = female

Conclusions & Recommendations

Gender of the participants, other teaching experiences, nor certification area had a strong relationship to their primary Stage of Concern. This study concurred with Aneke and Finch’s (1997) conclusion that years of teaching experience did not affect teachers’ SoC. This conclusion indicates teachers with different areas of certification and various levels of teaching experience can successfully implement CARS. Researchers should further investigate if specific types of experiences find it easier to integrate CARS.

Length of involvement with the innovation and participants’ primary Stage of Concern had a low magnitude correlation (r = .26) indicating, as teachers have more experience with the innovation, their concerns had a slight tendency to progress to higher stages. These findings reinforce the 3-5 year time frame Hall and Hord (2006) identified for an innovation to be implemented at a high level and the first change principle “Change is a process, not an event” (p. 4). However, the correlation only explains 6.86% of the variance. Additionally the finding corroborated Aneke and Finch’s (1997) conclusion that teachers with more innovation-related experience had further progressed concerns. However, the correlation between the frequency of CARS incorporation and teachers’ primary Stage of Concern contradicted Aneke and Finch’s finding. This negative correlation indicated that teachers who incorporated CARS more frequently tended to have lower primary Stages of Concern.

When profiles were developed based upon weekly, monthly, and seldom/never use of CARS, no substantial differences were found, which did not support any of the literature or other findings. Although social desirability bias, when respondents answer the way they think they are supposed to answer, rather than responding with the truthful answer, may offer one explanation to this oddity (Ary et al., 2006). If teachers misreported the frequency with which they utilize CARS based on how often they are suppose to use CARS rather than reporting their actual usage, they could have biased the information collected and caused the peculiarity in the findings. More research should be completed to determine if this correlation can be supported or not.

The third of participants (n = 48) who reported a weak or very weak relationship with their reading coach may have an opportunity to progress through the Stages of Concern by developing a stronger relationship. The reading coach should participate on the change facilitator team for the CARS innovation to provide their expertise and develop relationships with the teachers. Teachers with a better working relationship with the reading coach will most likely feel more comfortable to approach the reading coach for support or more confident in the information the reading coach provides them. Hall and Hord (2006) underscore the importance this interaction plays in successful im-
plementation. Close working relationships between agriscience teachers and reading coaches should be nourished and researchers should investigate the effects of these relationships to CARS implementation.

Teachers tend to move through the Stages of Concern as their perceived level of expertise increases. This self-perceived expertise accounted for 9.12% of the variance. This supports Aneke and Finch’s (1997) conclusion that teachers’ concerns progressed as their experience with the innovation increased. Teachers can improve the effectiveness and efficiency of their use of CARS from their experiences. As these teachers become more effective in their use of the strategy and it becomes a natural teaching tool, they can focus more on the high level concerns and less on the lower level concerns. Building experiences through professional development programs may enable teachers to progress through the Stages of Concern faster.

The large standard deviation (SD = 52.20) and range (312) between the total number of professional development hours indicated a lack of consistency in professional development programs completed by agriscience teachers. The results have clearly indicated that the total number of CARS professional development hours is not related to progression through the Stages of Concern. These results contradict Aneke and Finch (1997) who found that Stages of Concern profiles and the intensity of the concerns changed when grouped by “hours of reform-related training” (p. 10). However, Aneke and Finch underscored the importance of these trainings to address the personal concerns of the participating teachers. This observation may indicate that it is more important to focus on the quality of the professional development and its ability to meet the needs of the teachers, rather than just the number of hours spent in professional development.

Baker, Gersten, Dimino, and Griffiths (2004) identified three key components of a professional development program which led to sustained success of an educational innovation. These components included: (1) an initial training to establish the big picture, (2) on-going, on-site support for the first 5 years, and (3) school investment of funds. The authors emphasized the importance of providing on-going support throughout the implementation process which supports similar suggestions made by Hall and Hord (2006). Agriscience teachers have acknowledged that implementing this innovation will require time to adapt (Park, 2005). Ongoing support during this adaptation period should make the process more effective and more efficient.

Based on this study, the researcher suggests that practitioners consider the following recommendations:

1. A consistent, in depth professional development program should be implemented to provide ongoing training and support of the innovation throughout a several year process.
2. Professional development should provide an opportunity for teachers to demonstrate and practice their CARS skills.
3. Schools should utilize Stages of Concern questionnaires to measure the effect of professional development on Stages of Concern and measure the success of implementation.

This study has identified the need for research in the following areas:

1. Research should be conducted to verify the concern profiles developed for the participants in this study.
2. In order to better understand the differences of the professional development programs, research should be conducted to determine the characteristics of various CARS professional development programs.
3. Research should be completed on the effectiveness of different professional development programs in order to be able to design more effective and efficient programs.
4. To better meet the professional development needs of teachers, research should be conducted to identify the specific CARS professional development needs of agriscience teachers.
5. Further research should examine these variables and their relationship to the CARS innovation.
6. Motivation levels of agriculture teachers to participate in the CARS innovation implementation. Professional development theory holds that successful implementation and continuation of CARS instruction is relies heavily on sustained consistent teacher professional development and support (Vacca, 2002a, Vacca 2002b). The findings of this study suggest that professional development opportunities provided to agriscience teachers in the area of Content Area Reading Strategies is neither sustained nor consistent. This incongruence must be addressed by the profession in order or any real impact to be realized in the agriscience classrooms. Without consistency in the method and message of teacher professional development, research in assessing the impact of such activities will continue to be very difficult.

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ANNA J. WARNER is an Agriscience Teacher at Manchester Valley High School, 3300 Maple Grove Rd., Manchester, MD 21102, ajwarne@carrollk12.org

BRIAN E. MYERS is an Associate Professor in the Department of Agricultural Education and Communication at the University of Florida, 307A Rolfs Hall, P. O. Box 110540, Gainesville, FL 32611, bmyers@ufl.edu
An Analysis of FFA Chapter Demographics as Compared to Schools and Communities

Shannon Lawrence
John Rayfield
Lori L. Moore
Corliss Outley
Texas A&M University

This descriptive study was a special project for the National FFA Organization to determine the demographic makeup of rural, suburban, urban, and randomly selected at-large FFA chapters from the four national FFA regions. Summary data for this study revealed that gender in selected FFA chapters was 55% male and 45% female. Eighty percent of FFA members were reported to be White while the respective communities were 54% White. Rural FFA chapters had the highest percentage of FFA members in relation to their agricultural education course enrollments. Urban chapters reported more than half (52%) of their agricultural education students were FFA members. The majority of agricultural education teachers are White males. The demographic characteristics of FFA chapters in relation to their respective schools and communities provide a snapshot of today’s agricultural education programs and FFA chapters. Furthermore, this research could help identify strategies to move FFA chapters toward a more parallel representation of the schools and communities in which they exist.

Keywords: FFA chapter demographics, school demographics, community demographics

According to Talbert and Edwin (2008), diversity is one of the most “significant social aspects” (p. 51) in the United States because of the rapid change in demographics. Because of those rapid demographic changes, “opportunities to maintain a pipeline of future agriculturalists will depend on the ability of secondary agricultural education programs to attract students from non-traditional backgrounds” (Esters & Bowen, 2004, p. 25). Priority four of the national research agenda for agricultural education contains a scientific focus to “examine the role of diversity and multiple perspectives in meaningful learning across agricultural education contexts” (Doerfert, 2011, p. 9). Igo and White (1999) made a prediction that before the turn of the 21st century “future generations of FFA members will increasingly be urban, while the minority will be rural. Few will have a farm background, and even less will have family ties to production agriculture” (p. 9).

Even though the United States has become more racially/ethnically diverse and school populations around the nation have changed, school-based agricultural education programs have not (Bowen, 2002; LaVergne, Larke, Elbert, & Jones, 2011). Opportunities exist to increase agricultural education enrollment, FFA membership, and benefits to many students as the ethnic and racial composition in the United States changes rapidly (Roberts et al., 2009). Currently, “millions of students each year, from all ethnicities, are missing the numerous benefits provided through agricultural education and FFA” (Roberts et al., 2009, p. 70). Agricultural education should recognize the importance of recruiting students so the student body will “resemble the diversity of this country, of local communities, and of individual schools” (Roberts et al., 2009, p. 70) to ensure its future success.

Roberts et al. (2009) posited “the current demographics of FFA and agricultural education do not align with the 21st century ethnicity of many public schools” (p. 69). Few could argue that the recruitment of a diverse student population is not essential for a student organization to thrive (Brown, 2002). However, studies have shown there are many barriers that can preclude
minority students from enrolling in agricultural education programs (Cano & Bankston, 1992; Connors, Moore, & Elliott, 1990; Gliem & Gliem, 2000; Hoover & Scanlon, 1991; LaVergne et al., 2011; Talbert & Larke, 1995; Warren & Alston, 2007).

According to National FFA statistics, as of 2010 there were 7,487 FFA chapters across the United States, Puerto Rico, and the Virgin Islands. Of these 7,487 chapters, the composition of members was 76% White, 16% Hispanic, 4% African-American, and 2% American Indian (National FFA, 2011a). According to the U.S. Census Bureau in 2010 the respective percentages for the U.S. population were 72.4%, 16.3%, 12.6% and 0.9%. While these statistics are similar, school districts may not be accurately represented by national statistics.

The members of FFA and other youth agricultural education programs along with graduates in agricultural education teacher education programs across the nation do not reflect the “ethnic influx” (LaVergne et al., 2011, p. 140) that is occurring (Kantrovich, 2007; Rocca & Washburn, 2008; Talbert & Edwin, 2008; Talbert & Larke, 1995). Furthermore, LaVergne, et al. found that “most agricultural educators are not enrolling in diversity/multicultural courses in an undergraduate academic program” (p. 147). The field of agricultural education must begin to critically assess its recruitment, engagement, and retention of ethnically diverse youth or face the demise of the field in the future (Bowen, 2002). It is also important to study the demographics of the organization because having members with different perspectives, experiences, and knowledge will increase creative solutions to problems and increase the amount of available talent for filling important jobs in the workforce (Yukl, 2006).

The historical context of racial/ethnic agricultural teachers is not new. As late as 1963, the New Farmers of America (NFA), a national organization for Black farm boys enrolled in vocational agriculture, had reached a membership of more than 58,000 (Wakefield & Talbert, 2000). However, since the merge of NFA with Future Farmers of America in 1965, the enrollment of Black students declined to approximately 21,000 in 2011 (National FFA, 2011a).

The mission of the National FFA Organization is “dedicated to making a positive difference in the lives of young people by developing their potential for premier leadership, personal growth, and career success through agricultural education” (National FFA, 2011b). FFA provides leadership development, service-learning opportunities, and career preparation for all students enrolled in agricultural education programs. As FFA members and agricultural education program’s students graduate and move on to post-secondary school or the workforce, they could potentially enter an area more diverse than where they attended high school.

Leventhal (1999) claimed “that students involved with vocational student organizations [VSOs] are likelier to be involved in community affairs and organizations, school organizations, church groups, etc.” (p. 24). If FFA members are indeed more likely to be involved with their local communities, one may be led to think the FFA chapter would reflect the community demographic makeup. More research is needed before this assertion can be made.

A study conducted by Gliem and Gliem in 2000 reported significantly more non-FFA members were Asian, Black, and Hispanic than were FFA members. A significant number of non-FFA members also responded they did not realize how agriculture directly or indirectly affects their lives and their community (Gliem & Gliem, 2000). Is there a disconnect between FFA chapter membership and local communities? Roberts et al. (2009) assumed there was a disconnect present in three schools in San Antonio. Their study revealed that one school had a 722% increase in Hispanic enrollment in agricultural education and a 350% increase in FFA membership during the three--year implementation of tailored recruitment programs. Perhaps a school-by-school approach to increasing diversity of FFA chapters and agricultural education programs is an effective and efficient model for agricultural education.

Researchers have conducted numerous studies regarding diversity in agricultural education (Bowen, 2002; Esters & Bowen, 2004; Gliem & Gliem, 2000; Kantrovich, 2007; LaVergne et al., 2011; Roberts et al., 2009; Rocca & Washburn, 2008; Talbert & Edwin, 2008; Talbert & Larke, 1995; Wakefield & Talbert, 2000). Bowen
(2002) challenged the field of agricultural education to develop strategies to recruit a new ethnically diverse pool of agricultural teachers or face irrelevancy in the future. More than 10 years have passed since Bowen (2002) issued his challenge. Has the profession specifically tied to FFA heeded Bowen’s warnings in 2001 and begun to change? This study sought to describe demographic characteristics of FFA chapters and FFA advisors to benchmark the status of selected programs within the schools and communities they reside to give insight to professionals involved with FFA.

**Purpose and Objectives**

The purpose of this study was to determine the demographic characteristics of selected FFA chapters in the United States as well as the schools and communities in which these chapters exist. The following objectives were used to guide this study:

1. Describe selected FFA chapters in terms of selected demographic characteristics.
2. Describe the schools in which the selected FFA chapters exist in terms of selected demographic characteristics.
3. Describe the communities in which the selected FFA chapters exist in terms of selected demographic characteristics.
4. Describe the demographic characteristics of lead FFA advisors in selected FFA chapters.

**Methodology**

**Population and Sample**

The population of interest for this study consisted of three groups: (1) rural, suburban, and urban (as defined by the U.S. Census Bureau) FFA chapters from the four National FFA regions; (2) schools in which these FFA chapters exist; and (3) communities in which the schools are located. A list of all chartered FFA chapters was obtained from the National FFA Organization. The chapters were sorted into four lists based on the four recognized regions: Central Region, Eastern Region, Southern Region, and Western Region. Chapters within each region were then categorized according to population density as rural (areas of less than 2,500 people), suburban (U.S. Census Bureau urban clusters of between 2,500 and 50,000 people), or urban (U.S. Census Bureau urban areas of 50,000 or more people). Microsoft Excel® and zip code population data obtained from the U.S. Census Bureau were used to categorize the FFA chapters. Categorized email addresses became panel groups and were loaded into Qualtrics, an online survey provider utilized by Texas A&M University.

An email invitation was sent to all FFA chapters (N= 7,418) with a valid email address via Qualtrics. Three hundred forty-six responses were obtained from the email invitation. Stratified random sampling (Ary, Jacobs, & Razavieh, 1996; Isaac & Michael, 1997) was used to select the 128 FFA chapters and corresponding schools and communities to be included from the 346 responses received from the convenience sample. Stratified random sampling allowed the researchers to represent both the overall population and key subgroups such as regions and population density areas while simultaneously providing a more representative sample of the entire population of FFA chapters (Ary, Jacobs, & Razavieh, 1996).

The rural, suburban, and urban population density categories within each region served as the strata or subgroups. Within each strata of each region, eight chapters were randomly selected for inclusion in the study from those who replied to the request for participation. Thus, eight rural chapters from each of the four regions (32 rural chapters total), eight suburban chapters from each of the four regions (32 suburban chapters total), eight urban chapters from each of the four regions (32 urban chapters total), and eight at-large chapters from each of the four regions (32 at-large chapters total) were included in the study. One hundred twenty-eight FFA chapters and their corresponding schools and communities were selected for the study (see Table 1).
Table 1
FFA Chapters, Schools, and Communities Selected for Inclusion in the Study

<table>
<thead>
<tr>
<th>Region</th>
<th>Rural</th>
<th>Suburban</th>
<th>Urban</th>
<th>At-Large</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Central</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>32</td>
</tr>
<tr>
<td>Eastern</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>32</td>
</tr>
<tr>
<td>Southern</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>32</td>
</tr>
<tr>
<td>Western</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>32</td>
</tr>
<tr>
<td>Total</td>
<td>32</td>
<td>32</td>
<td>32</td>
<td>32</td>
<td>128</td>
</tr>
</tbody>
</table>

**Data Collection and Analysis**

Selected demographic characteristics were collected at three different levels: (1) FFA chapter, (2) school, and (3) community. At the chapter level, the lead FFA advisor reported demographics for his or her program. A lead FFA advisor was operationally defined as the teacher in charge of the managerial duties for each local FFA chapter. Data collected included agricultural education program enrollment, number of FFA members, FFA member gender, and FFA member ethnicity. Lead FFA advisor gender and ethnicity were collected from direct contacts via email and/or phone.

School level demographic data for student gender and ethnicity were collected from statistics available on the National Center for Educational Statistics (NCES) website, State Department of Education websites (including School Report Card), high-schools.com, and schooltree.org. Community level demographic data for gender and ethnicity were obtained from the NCES website and city-data.com. Data were analyzed using Microsoft Excel. Descriptive statistics were used to accomplish the objectives of the study.

**Results**

Summary findings for agricultural education program enrollment, FFA chapter membership, teacher demographics, and gender and ethnicity of FFA chapters and their respective schools and communities are described and discussed based on the strata used in the study.

**Rural Chapters**

Summary data for the gender and ethnicity within the 32 rural chapters and the respective schools and communities are presented in Table 2. The average number of students in the agricultural education programs in these 32 chapters was 73.81 and the average number of FFA members was 52.59. Therefore, on average, 71.25% of students enrolled in agricultural education in the study’s 32 rural chapters were FFA members. Thirty-one of the 32 FFA chapters had one FFA advisor and the remaining chapter had two FFA advisors yielding an average of 1.03 FFA advisors per chapter. Twenty-six of the 32 lead FFA advisors were male and six were female. All 32 lead FFA advisors were White.
Table 2
Summary of Gender and Ethnicity for Selected Rural FFA Chapters and their Respective Schools and Communities (n = 32)

<table>
<thead>
<tr>
<th>Demographic Characteristic</th>
<th>FFA Chapter</th>
<th>School</th>
<th>Community</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>f</td>
<td>%</td>
<td>f</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>684</td>
<td>42.48</td>
<td>3,842</td>
</tr>
<tr>
<td>Male</td>
<td>926</td>
<td>57.52</td>
<td>4,094</td>
</tr>
<tr>
<td>Ethnicity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asian/Pacific Islander</td>
<td>2</td>
<td>0.12</td>
<td>139</td>
</tr>
<tr>
<td>Black</td>
<td>29</td>
<td>1.71</td>
<td>835</td>
</tr>
<tr>
<td>Hispanic</td>
<td>153</td>
<td>9.02</td>
<td>1,227</td>
</tr>
<tr>
<td>Native American</td>
<td>6</td>
<td>0.35</td>
<td>29</td>
</tr>
<tr>
<td>Other</td>
<td>0</td>
<td>0.00</td>
<td>53</td>
</tr>
<tr>
<td>White</td>
<td>1,506</td>
<td>88.80</td>
<td>6,439</td>
</tr>
</tbody>
</table>

Note. Unreported gender and ethnicity data were not included in summary analysis.

Suburban Chapters

Summary data for the gender and ethnicity within the 32 suburban chapters and the respective schools and communities are presented in Table 3. The average number of students in the agricultural education programs in these 32 chapters was 123.09, and the average number of FFA members was 84.03. Therefore, on average, 68.27% of students enrolled in agricultural education in this study’s 32 suburban chapters were FFA members. There were 46 FFA advisors for these 32 chapters yielding an average of 1.44 FFA advisors per chapter. Twenty of the 32 lead FFA advisors were male, and 12 were female. Twenty-nine of the lead FFA advisors were White, one was Native American, one was Black, and one was Hispanic.

Table 3
Summary of Gender and Ethnicity for Selected Suburban FFA Chapters and their Respective Schools and Communities (n = 32)

<table>
<thead>
<tr>
<th>Demographic Characteristic</th>
<th>FFA Chapter</th>
<th>School</th>
<th>Community</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>f</td>
<td>%</td>
<td>f</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>1,265</td>
<td>45.70</td>
<td>10,820</td>
</tr>
<tr>
<td>Male</td>
<td>1,503</td>
<td>54.30</td>
<td>11,490</td>
</tr>
<tr>
<td>Ethnicity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asian/Pacific Islander</td>
<td>9</td>
<td>0.32</td>
<td>168</td>
</tr>
<tr>
<td>Black</td>
<td>125</td>
<td>4.51</td>
<td>1,748</td>
</tr>
<tr>
<td>Hispanic</td>
<td>167</td>
<td>6.02</td>
<td>3,084</td>
</tr>
<tr>
<td>Native American</td>
<td>138</td>
<td>4.97</td>
<td>1,047</td>
</tr>
<tr>
<td>Other</td>
<td>1</td>
<td>0.04</td>
<td>10</td>
</tr>
<tr>
<td>White</td>
<td>2,334</td>
<td>84.14</td>
<td>16,260</td>
</tr>
</tbody>
</table>

Note. Unreported gender and ethnicity data were not included in summary analysis.
Urban Chapters

Summary data for gender and ethnicity within the 32 urban chapters and their respective schools and communities are presented in Table 4. The average number of students in the agricultural education programs in these 32 chapters was 149.09, and the average number of FFA members was 77.94. Therefore, on average, 52.27% of students enrolled in agricultural education in this study’s 32 urban chapters were FFA members. There were 38 FFA advisors in these 32 chapters yielding an average of 1.19 FFA advisors per chapter. Of the 32 lead FFA advisors, 17 were male, 14 were female, and one did not report their gender. Of the 32 lead advisors, 30 were White, one was a Native American, and one was Hispanic.

Table 4
Summary of Gender and Ethnicity for Selected Urban FFA Chapters and their Respective Schools and Communities (n = 32)

<table>
<thead>
<tr>
<th>Demographic Characteristic</th>
<th>FFA Chapter</th>
<th>School</th>
<th>Community</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>f</td>
<td>%</td>
<td>f</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>1,117</td>
<td>49.53</td>
<td>21,519</td>
</tr>
<tr>
<td>Male</td>
<td>1,138</td>
<td>50.47</td>
<td>22,880</td>
</tr>
<tr>
<td>Ethnicity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asian/Pacific Islander</td>
<td>42</td>
<td>1.65</td>
<td>1,577</td>
</tr>
<tr>
<td>Black</td>
<td>173</td>
<td>6.81</td>
<td>6,662</td>
</tr>
<tr>
<td>Hispanic</td>
<td>643</td>
<td>25.31</td>
<td>9,387</td>
</tr>
<tr>
<td>Native American</td>
<td>25</td>
<td>0.98</td>
<td>598</td>
</tr>
<tr>
<td>Other</td>
<td>7</td>
<td>0.28</td>
<td>180</td>
</tr>
<tr>
<td>White</td>
<td>1,650</td>
<td>64.96</td>
<td>26,013</td>
</tr>
</tbody>
</table>

Note. Any unreported gender and ethnicity data were not included in summary analysis.

At-Large Chapters

Summary data for gender and ethnicity within the 32 at-large chapters and their respective schools and communities are presented in Table 5. The average number of students in the agricultural education programs in these 32 chapters was 102.72 and the average number of FFA members was 64.78. Therefore, on average, 63.07% of students enrolled in agricultural education in this study’s 32 at-large chapters were FFA members. There were 38 FFA advisors in these 32 chapters yielding an average of 1.19 FFA advisors per chapter. Of the 32 lead FFA advisors, 27 were male and five were female. Thirty of the 32 lead FFA advisors were White, one was Hispanic, and one did not report ethnicity.
Table 5
Summary of Gender and Ethnicity for Selected At-Large FFA Chapters and their Respective Schools and Communities (n = 32)

<table>
<thead>
<tr>
<th>Demographic Characteristic</th>
<th>FFA Chapter</th>
<th>School</th>
<th>Community</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>f</td>
<td>%</td>
<td>f</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>887</td>
<td>41.28</td>
<td>9,037</td>
</tr>
<tr>
<td>Male</td>
<td>1,262</td>
<td>58.72</td>
<td>9,364</td>
</tr>
<tr>
<td>Ethnicity</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Asian/Pacific Islander</td>
<td>5</td>
<td>0.23</td>
<td>136</td>
</tr>
<tr>
<td>Black</td>
<td>52</td>
<td>2.39</td>
<td>1,069</td>
</tr>
<tr>
<td>Hispanic</td>
<td>186</td>
<td>8.54</td>
<td>3,444</td>
</tr>
<tr>
<td>Native American</td>
<td>32</td>
<td>1.47</td>
<td>165</td>
</tr>
<tr>
<td>Other</td>
<td>5</td>
<td>0.23</td>
<td>6</td>
</tr>
<tr>
<td>White</td>
<td>1,897</td>
<td>87.14</td>
<td>13,701</td>
</tr>
</tbody>
</table>

Note. Unreported gender and ethnicity data were not included in summary analysis.

All Chapters

Summary data for gender and ethnicity within the 128 chapters selected for inclusion in this study and their respective schools and communities are presented in Table 6. The average number of students in the agricultural education programs in these 128 chapters was 112.18 and the average number of FFA members was 69.83. Therefore, on average, 62.25% of all students enrolled in the agricultural education programs in this study’s 128 chapters were FFA members. There were a total of 155 FFA advisors from the 128 chapters yielding an average of 1.21 FFA advisors per chapter.

Table 6
Summary of Gender and Ethnicity for Selected FFA Chapters and their Respective Schools and Communities (N =128)

<table>
<thead>
<tr>
<th>Demographic Characteristic</th>
<th>FFA Chapter</th>
<th>School</th>
<th>Community</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>f</td>
<td>%</td>
<td>f</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>3,926</td>
<td>45.05</td>
<td>45,218</td>
</tr>
<tr>
<td>Male</td>
<td>4,789</td>
<td>54.95</td>
<td>47,810</td>
</tr>
<tr>
<td>Ethnicity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asian/Pacific Islander</td>
<td>58</td>
<td>0.63</td>
<td>2,020</td>
</tr>
<tr>
<td>Black</td>
<td>379</td>
<td>4.13</td>
<td>10,314</td>
</tr>
<tr>
<td>Hispanic</td>
<td>1,149</td>
<td>12.51</td>
<td>17,142</td>
</tr>
<tr>
<td>Native American</td>
<td>201</td>
<td>2.19</td>
<td>1,839</td>
</tr>
<tr>
<td>Other</td>
<td>13</td>
<td>0.14</td>
<td>249</td>
</tr>
<tr>
<td>White</td>
<td>7,387</td>
<td>80.41</td>
<td>62,413</td>
</tr>
</tbody>
</table>

Note. Unreported gender and ethnicity data were not included in summary analysis.
FFA Membership and Agricultural Education Enrollment

Summary data for agricultural education program enrollment and FFA membership by population classification are presented in Table 7. In rural chapters, 71.25% of students enrolled in agricultural education were FFA members. In suburban chapters, 68.27% of students enrolled in agricultural education were FFA members. In urban chapters, 52.27% of students enrolled in agricultural education were FFA members. In the chapters selected at-large, 63.07% of students enrolled in agricultural education were FFA members. Overall, 62.25% of students enrolled in agricultural education courses were FFA members. However, it must be noted that some chapters reported more FFA members than students enrolled in agricultural education. This could be explained if the school was on a block schedule, if the chapter had post-graduation members, and if students prepaid dues for the following semester when they would be enrolled in an agricultural education course.

Table 7
Summary of Agricultural Education Enrollment and FFA Membership by Population Classification

<table>
<thead>
<tr>
<th>Agricultural Education Students</th>
<th>FFA Members</th>
<th>Percentage of FFA Members</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rural Chapters</td>
<td>2,362</td>
<td>1,683</td>
</tr>
<tr>
<td>Suburban Chapters</td>
<td>3,939</td>
<td>2,689</td>
</tr>
<tr>
<td>Urban Chapters</td>
<td>4,771</td>
<td>2,494</td>
</tr>
<tr>
<td>At-Large Chapters</td>
<td>3,287</td>
<td>2,073</td>
</tr>
<tr>
<td>National Totals</td>
<td>14,359</td>
<td>8,939</td>
</tr>
</tbody>
</table>

FFA Advisors

Summary data for gender and ethnicity of the 128 lead FFA advisors by population classification are shown in Table 8. More than one-half of the teachers in each population classification were White males. In the rural chapters, more than three-quarters of the lead FFA advisors were White males (n = 28, 87.50%). Of the 31 lead FFA advisors in the suburban chapters who reported gender and ethnicity, slightly more than half (n = 17, 54.84%) were White males. Of the 31 lead FFA advisors who reported gender and ethnicity in the urban chapters, slightly more than half (n = 16, 51.61%) were White males. In the at-large chapters, slightly more than three-quarters (n = 25, 78.13%) of the lead FFA advisors were White males.

Table 8
Summary of Lead FFA Advisor Gender and Ethnicity by Population Classification

<table>
<thead>
<tr>
<th>Gender</th>
<th>Female</th>
<th>White</th>
<th>Male</th>
<th>Black</th>
<th>Hispanic</th>
<th>Native American</th>
<th>White</th>
<th>Unreported ethnicity</th>
<th>Unreported Gender</th>
<th>Native American</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rural</td>
<td>4</td>
<td>12</td>
<td>14</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>28</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Chapters</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Suburban</td>
<td>0</td>
<td>12</td>
<td>14</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>18</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Chapter</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Urban</td>
<td>0</td>
<td>12</td>
<td>14</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Chapters</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>At-Large</td>
<td>0</td>
<td>12</td>
<td>14</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Chapters</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>National</td>
<td>0</td>
<td>12</td>
<td>14</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Totals</td>
<td>4</td>
<td>12</td>
<td>14</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>28</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>
Conclusions, Recommendations and Implications

Caution should be used when interpreting self-reported data collected from numerous sources. This study was purely descriptive in nature. No inferences should be made beyond the scope of this study based on these findings. Caution must be taken in interpreting the results of this study due to the nature of convenience sampling techniques. The most telling conclusion was there are few centralized sources of demographic data for FFA chapters. In fact, there was no single source containing all of the demographic data of interest. As a result, compiling summary data that truly portrays all FFA chapters and their respective schools and communities across the country was challenging.

A panel of university faculty deemed public sources of information appropriate for the research project. Utilizing available public access information was useful and could prove valuable for other researchers who wish to replicate the study or further investigate the findings of this study. Additionally, agricultural education teachers provided adequate responses, but it is important to remember that these were self-reported data from the lead agricultural education teachers. The researchers assumed the teachers answered honestly and objectively.

Gender

Overall, there were more males in the 128 selected FFA chapters \( (n = 4789, 54.95\%) \) and their respective schools \( (n = 47,810, 51.39\%) \) and communities \( (n = 775,904, 50.94\%) \) than females. However, when looking at the different population categories (rural, suburban, urban), there were some trends of interest. The overall trend was female FFA members became more prevalent the more urbanized the area became. Thus, the highest percentage of female members \( (49.53\%) \) was present in urban areas representing an 11% increase above what was reported on the National FFA Organization (2011a) website for overall female membership. Are males drawn to rural programs more readily than females? Are females more likely to join FFA in urban programs? Are these questions true for all urban areas, or do regions have an effect on demographic makeup? These questions require further investigation and could offer insight into tailored recruitment strategies for FFA chapters as reported in Roberts et al. (2009).

Ethnicity

Ethnicity percentages changed between the categories of chapter, school, and community. The overall results indicate FFA chapters were 80.41% White, 12.51% Hispanic, 4.13% Black, 2.19% Native American, 0.63% Asian/Pacific Islander, and 0.14% Other. Although Roberts et al. (2009) reported that agricultural education and the National FFA Organization can be appealing to Hispanic students, the percentage of Hispanic students remains low.

According to available data sources, greater heterogeneity was present in the school and community than was present in the FFA chapters in this study. However, as population increased so did the heterogeneity of FFA chapter members. While it was unclear exactly why this phenomenon took place, one could hypothesize that it was due to more diverse populations being in urban areas. Nonetheless, these findings support Bowen (2002) that school populations have become more racially/ethnically diverse, but school-based agricultural education programs do not reflect the level of diversity found in their respective schools.

FFA Membership and Agricultural Education Enrollment

Summary data of agricultural education enrollment and FFA membership by population categories revealed interesting trends for this study. However, it must be noted that the data reported in the study for agricultural education program enrollment and FFA membership were self-reported by the lead FFA advisor. Additionally, some advisors reported more FFA members than students enrolled in their agricultural education program, which could be explained through block scheduling or having post-graduation FFA members working toward their American FFA Degree.

Of the agricultural education programs sampled, the summary data for agricultural education enrollment and FFA membership by pop-
ulation classification validated what some might assume to be true about an organization devoted to agriculture: Rural communities sampled had the highest percentage of FFA membership at 71%. However, suburban communities closely followed at 68% and at-large communities had 63% FFA membership. Urban communities in this study had the lowest percentage of FFA membership at 52%.

Although there has been expansion of agricultural education programs in suburban and urban areas, based on percentages, these findings do not currently support Igo and White (1999). The results of this study could, however, represent areas of membership growth potential just as Roberts et al. posited in 2009. If the National FFA Organization plans to increase membership substantially, more focus could be placed on the development of recruitment strategies and stakeholder buy-in campaigns for suburban and urban agricultural education programs. Strategies that focus on parents in urban areas as suggested by Esters and Bowen (2004) could also help increase both the numbers of FFA members and their diversity.

FFA Advisors

A snapshot of the FFA advisors or the teacher recognized as the lead FFA advisor in the agricultural education program from the 128 programs revealed that the majority (68.25%) were White males (n = 86). This aligns with Talbert and Larke’s (1995) findings that the majority of agricultural education teachers are White males. Thirty-five advisors (27.78%) in this study were White females. There were three Hispanic males, one Black male and one Native American male serving as lead FFA advisors in the selected chapters. All female lead advisors in the 128 FFA chapters reported in this study were White. There were more females advising FFA chapters in urban (n = 14) and suburban (n = 12) settings than in rural (n = 4) locations. Bowen (2002) stated that our field must develop strategies to recruit an ethnically diverse pool of agricultural teachers or face irrelevancy in the future. Warren and Alston (2007) pointed out that both students and teachers can benefit from the inclusion of ethnic minorities and women in the profession. Further investigation is needed to determine if and why females are teaching agricultural education and advising FFA chapters with a higher frequency in urban and suburban areas than in rural areas.

Results of this study provided insight into the makeup of FFA chapters across the nation and how they reflect the school and communities in which they exist. FFA chapters were predominately White and relatively evenly split in terms of gender. Wakefield and Talbert (2000) suggested that the decline among Black students in youth programs was because too few students are interested in and were accepted into agricultural programs as well as the decline in hiring of minority agricultural education teachers. FFA chapters led by advisors who were not White did not represent the ethnic makeup of the school or community. The main concern that arose from these findings was why do FFA chapters not closely mirror the schools and communities they reside in? Additional time, resources, and research should be devoted to further investigation.

Recommendations for Practice

The following questions may apply to agricultural education teachers, state agricultural education staff, agricultural education teacher education faculty, key industry stakeholders and National FFA staff as a means of stimulating discussion about how to further agricultural education’s future.

1) Should agricultural education teachers receive professional development on how to recruit and retain increased numbers of diverse students?

2) Should National/State FFA explore more opportunities to recognize chapters who excel in both recruitment of diverse members and accomplishment of the FFA mission?

3) Could creating and incentivizing an accurate reporting system (state or national) help agriculture teachers accurately report demographic information to National FFA?

4) Should round-table discussions at yearly meetings be developed to strategize about ways to further investigate and
Recommendations for Future Research

There are many different avenues for future research based on demographic characteristics of youth involved in FFA. The following are examples of projects and questions that could advance the study of diversity and expand FFA membership.

1) Through survey research and collaboration with AAAE Member Institutions, NAAE, and National FFA, a national database of valid email addresses for agricultural education teachers could be developed and maintained to provide an accessible population for future research regarding the demographic composition of agricultural education programs.

2) How do the demographic characteristics of agricultural education teacher affect the demographic makeup of the FFA chapter?

3) Do urban FFA chapters have a significantly lower percentage of FFA members than other chapters?

4) Why do few ethnically diverse men or women choose/not choose careers as agricultural education teachers?

5) Are female students more likely to join a rural, suburban, or urban FFA chapter?

6) Explore non-agricultural education and agricultural education student perceptions of FFA in rural, suburban, and urban chapters.

7) Explore teacher perceived barriers to recruitment of diverse students.

Agricultural education has a far-reaching history. As the future materializes ahead of stakeholders involved in agricultural education, expanding the diversity of the program is not an option, it is a necessity (Bowen, 2002; Gliem & Gliem, 2000). Furthermore, if FFA program leaders do not try to “appeal to the new ‘consumer’, then they will become inconsequential in the school environment … more importantly, a segment of young men and women will miss out on the rich opportunities agriculture and the FFA holds for them” (Jahnke, 2011, para. 9).

References


SHANNON LAWRENCE is an Instructor in the Agricultural Education Department at Clemson University, 253 McAdams, Clemson, SC, 29634, sglawre@clemson.edu.

JOHN RAYFIELD is an Assistant Professor in Agricultural Leadership, Education, and Communications at Texas A&M University, MS 2116 TAMU, College Station, TX 77843-2116, jrayfield@tamu.edu.

LORI L. MOORE is an Assistant Professor in Agricultural Leadership, Education, and Communications at Texas A&M University, MS 2116 TAMU, College Station, TX 77843-2116, lmoore@tamu.edu.

CORLISS OUTLEY is an Associate Professor in the Department of Recreation, Park, and Tourism Sciences at Texas A&M University, AGLS 427, College Station, TX 77843, coutley@tamu.edu.

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Competencies and Experiences Needed by Pre-service Agricultural Educators to Teach Globalized Curricula: A Modified Delphi Study

Nathan Conner  
T. Grady Roberts  
University of Florida

The 21st century graduate must be able to interact with people from all over the world and must also be knowledgeable about the world (Longview Foundation, 2008). In order to produce graduates that are globally competent, the National Council for the Accreditation of Teachers (NCATE, 1982) has mandated that multi-cultural education be incorporated as part of the teacher-preparation curricula. The purpose of this study was to identify competencies and experiences needed by agricultural pre-service teachers in order to teach globalized curricula. A modified Delphi method was used and the panel consisted of 13 (n = 13) experts in the field of agricultural teacher education with additional experience in international agricultural education or extension. Twenty competencies and two experiences were identified for pre-service agricultural educators to teach globalized curricula at the high school level.

Keywords: agricultural education; competencies; globalized curricula; Delphi; pre-service teachers

The agricultural industry represents a global marketplace where producers purchase inputs from around the world and sell their outputs to consumers across the globe (National Research Council, 2009). The expectations on college graduates have changed immensely due to the nature of today’s agricultural industry. A 21st century graduate “will need extensive knowledge of the world and the skills and dispositions to engage with people from many cultures and countries” (Longview Foundation, 2008, p. 3). The National Research Council (2009) recognized a need to expose undergraduate agricultural students to international perspectives in preparation for their future agricultural careers and recommended the following: (a) learning-abroad programs; and (b) the infusion of international perspectives into traditional agricultural courses.

These global expectations are not limited to college graduates. Employers recognize the importance of hiring high school graduates with the skills that promote effective interaction with people on a global level (Longview Foundation, 2008). Employers prefer to hire graduates who are globally competent. According to the Longview Foundation, a globally competent student has:

- Knowledge of and curiosity about the world’s history, geography, cultures, environmental and economic systems, and current international issues
- Language and cross-cultural skills to communicate effectively with people from other countries, understand multiple perspectives, and use primary sources from around the globe
- A commitment to ethical citizenship (p. 7)

In order for high schools to produce globally competent graduates, the teachers and the curricula must encourage and promote the importance of globalization and multi-culturalism. If teachers are not globally competent, it is unlikely that they will be able to prepare their students to be globally competent. The National Council for the Accreditation of Teachers (NCATE, 1982), mandated that multi-cultural education be incorporated into existing teacher-preparation programs. Multi-cultural education could be implemented in many differ-
ent ways including: coursework, readings, field experiences, and clinical experiences (NCATE, 1982), typically emphasizing multi-cultural aspects within the United States.

Although the call has been made for universities and colleges to produce teachers who are globally competent, the demand is not being met (Merryfield, 2000). In order for a teacher to effectively produce globally competent students, the teacher must possess knowledge of international issues; have appreciation of multiple points of view, possess pedagogical skills, and have commitment to teaching students to become both local and global citizens (Longview Foundation, 2008). The competencies identified by the Longview Foundation are a good starting point, but fail to address discipline-specific competencies that an agricultural education teacher would need. What competencies and experiences would a secondary agricultural education teacher need to effectively prepare their students to work in a global workforce?

Theoretical Framework/Literature Review

Specifically, the researchers were interested in learning what pre-service teachers should know in order to teach a globalized agricultural education curricula and what experiences would help pre-service teachers construct their understanding of this knowledge. The theoretical framework for this study was based on constructivism and its central tenant that learners construct meaning from their own experiences (Fosnot, 1996; Ormrod, 2008). More precisely, this study used cognitive constructivism and experiential learning to guide the inquiry (Doolittle & Camp, 1999; Roberts, 2006).

This study was based in the context of agricultural education teacher-education programs. Cruickshank (1984) proposed a model for teacher-education that included five variables:

1. teacher educators,
2. teacher education students,
3. contexts of teacher-education,
4. content or curriculum in teacher-education, instruction, and
5. organization in teacher-education (p. 44–45).

All of the variables interact with each other and affect the outcomes of teacher-education (Cruickshank, 1984). This study will specifically examine the contexts and content for teacher-education programs in agricultural education related to globalizing the secondary curricula. What competencies and experiences do pre-service agricultural education teachers need in order to teach globalized curricula? The current literature on this topic is inadequate to answer this question.

In a study of agricultural education undergraduates at Texas A&M University, Wingenbach et al. (2003) found that a mere 5% of the participants obtained a passing score on a knowledge test that focused on international agricultural issues. Navarro and Edwards (2008) concluded that internationalization of the undergraduate agricultural curriculum is often viewed as a stand-alone effort towards curriculum reform. Internationalization should be a “multi-faceted effort of curricular reform, a process embedded in all programs and a necessary ingredient in everything faculty do from an instructional perspective” (Navarro & Edwards, 2008, p. 79). One way students can experience international agriculture is through learning-abroad programs. These programs strive to improve cultural sensitivity and examine the multi-disciplinary approaches used within agriculture (National Research Council, 2009).

Educational disciplines have begun to examine this issue, often through the lens of multi-cultural education. This research has looked at pre-service teachers and teacher-educators. In order to produce educators who are prepared to teach a curriculum that integrates global knowledge and competencies, students must be exposed to multi-cultural and globalized curricula throughout their educational experience (Longview Foundation, 2008). As of 2008, the University of North Carolina and the University of Maryland required students to take coursework that focuses on international topics (Longview Foundation, 2008). However, students are not the only ones who need to experience a globalized curriculum; teacher educators need to have international knowledge and experience (Longview Foundation, 2008). Merryfield (2000) found that effective teacher educators that focus on multi-cultural and global educa-
tion had “significant experiences with people different from themselves” (p. 440), awareness of discrimination and injustice, been a minority, and “most importantly, they are conscious of how human differences are used by people in power to rationalize inequities, maintain their privilege and promote their culture as superior” (p. 440). Merryfield also found that “teacher educators in the study recognize that it is the interaction of identity, power, and lived experiences that has led to their work in multi–cultural and global education” (p. 441). Teacher educators are not successfully preparing future teachers to engage and teach from a multi–cultural and global perspective (Merryfield, 2000). Merryfield concluded that teacher–education programs must hire educators that have knowledge, experiences, and awareness of multi–cultural and global education in order to prepare students for global interconnectedness. It is up to teacher educators to promote an environment that encourages multi–cultural appreciation within the pre–service teacher program (Ambe, 2006).

In summary, the existing literature addresses what teachers should know about multi–cultural education and just scratches the surface with regards to international knowledge required of teachers. The literature also barely addresses international knowledge of college–level agricultural education students. In addition, the literature examines the knowledge required of teacher–educators. Although insightful, the existing literature fails to indicate which competencies and experiences a secondary agricultural education teacher needs to effectively teach globalized curricula.

**Purpose and Objectives**

The purpose of this study was to determine what pre–service agricultural educators would need in order to teach globalized curricula. The specific objectives were:

1. Identify global competencies that pre–service agricultural educators should possess before entering the teaching profession.
2. Identify global experiences that pre–service agricultural educators should obtain before entering the teaching profession.

**Methods**

A modified Delphi method was used for this study due to its acceptance and ability to identify a consensus from a panel of experts (Dalkey, 1969; Helmer, 1966; Stufflebeam, McCormick, Binkerhoff, & Nelson, 1985). The methods for this research were approved by the Institutional Review Board from the University of Florida. Three rounds of data collection were used to solicit the opinions of an expert panel. The criterion for membership on the panel was twofold: (a) the person must be currently working as a teacher–educator in agricultural education and (b) the person must have been involved in an international agricultural education or extension project. The researchers determined that these individuals would have the expertise to know what would be necessary to teach a globalized high school agriculture curricula and the expertise to understand what would be necessary to prepare a pre–service teacher for this task. The expert panel was formed using a snowball–sampling method (Goodman, 1961). To begin forming the panel, 4 agricultural education faculty from various institutions were identified as having considerable experience in this area and meeting the criterion. They were each asked to identify 4 or 5 additional agricultural educators that met the criteria. A total of 17 potential agricultural educators were identified and invited to participate in the study. A total of 13 experts representing 12 agricultural education programs throughout the United States agreed to participate.

Data were collected via an online survey tool called Qualtrics. Notifications for each round of the study were sent to each panelist using an email with a link to the questionnaire. The timing of pre–notice, notice, and follow–up emails were developed based on Dillman, Smyth, and Christian’s (2009) Tailored Design Method.

Round 1 of the study comprised of one open–ended question, “What competencies and experiences would a pre–service teacher need to effectively teach globalized agricultural curricula in the high school?” The responses to the ini-
tial question were analyzed and categorized using a constant–comparative method (Glaser & Straus, 1967). Response statements that were deemed to have the same meaning as response statements from other participants were condensed to one response statement. The response statements were categorized into competencies and experiences. Nine of the 13 members responded (69%) and identified 24 competencies and 18 experiences.

Round 2 consisted of a 42–statement questionnaire based on the findings from Round 1. The panelists utilized a five–point rating scale to rank their level of agreement or disagreement (strongly disagree, disagree, neither disagree nor agree, agree, strongly agree). The panelists were also given the opportunity to suggest wording of competencies and experiences and to suggest additional competencies and experiences. Thirteen members of the panel responded (100%) to the competency section of the questionnaire and 12 members of the panel responded (92%) to the experience section of the questionnaire. Upon completion of Round 2, the competencies and experiences were analyzed to determine which competencies and experiences would move on to Round 3. It was determined a priori that competencies and experiences with at least two–thirds of the panelists choosing agree or strongly agree would move on to round three. The panel members agreed on 24 competencies and 11 experiences. Two additional competencies were suggested in Round 2 and added for Round 3 based on the recommendations of panel members. Twelve competencies and experiences were also reworded based on suggestions from the panel.

Round 3 consisted of 24 competencies and 11 experiences in which the panelists were asked to use a dichotomous scale to indicate whether or not they agree or disagree with each competency and experience. The panelists were provided with the utilized statistics from Round 2 and also told which competencies and experiences were reworded. An 80% agreement rate was determined a priori to indicate that the competency or experience would be retained. Twelve participants responded to round 3.

Results

Round 1

Round 1 was designed to solicit a comprehensive list of competencies and experiences that pre–service agricultural educators might have in order to teach globalized curricula. As mentioned before, the open–ended prompt used to develop the lists was, “What competencies and experiences would a pre–service teacher need to effectively teach globalized agricultural curricula in the high school?” Panelists proposed 24 potential competencies and 18 potential experiences from the open–ended prompt. The identified competencies are presented in Table 1 and experiences are presented in Table 2.
Table 1
Descriptive Statistics of Competencies by Delphi Round 1 and 2

<table>
<thead>
<tr>
<th>Competencies Identified in Round 1</th>
<th>Round 2 (n = 13) Agree/Strongly Agree %</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Understand the connection between local agricultural production and the global agricultural economy</td>
<td>100.00(^a)</td>
</tr>
<tr>
<td>2. Understand the global interconnectedness of agricultural production systems (e.g. sources of production inputs such as seed, seedstock, fertilizer, livestock breedstock, etc.)</td>
<td>100.00</td>
</tr>
<tr>
<td>3. Understand the connection between the global economy and United States economy</td>
<td>100.00(^a)</td>
</tr>
<tr>
<td>4. Understand international issues that affect agriculture</td>
<td>100.00(^a)</td>
</tr>
<tr>
<td>5. Understand the role of agriculture in developing countries</td>
<td>100.00(^a)</td>
</tr>
<tr>
<td>6. Understand the importance of global agriculture</td>
<td>92.30</td>
</tr>
<tr>
<td>7. Understand agricultural production and commodities in major world regions</td>
<td>84.61</td>
</tr>
<tr>
<td>8. Have knowledge of international trade related to agricultural commodities</td>
<td>84.61(^a)</td>
</tr>
<tr>
<td>9. Have knowledge of the domestic and international agencies that impact agricultural economy</td>
<td>84.61(^a)</td>
</tr>
<tr>
<td>10. Understand the relationship between food security, national security, and political/cultural stability</td>
<td>84.61(^a)</td>
</tr>
<tr>
<td>11. Have an appreciation for cultural differences including religion, language, customs, and food</td>
<td>84.61</td>
</tr>
<tr>
<td>12. Have knowledge of world geography</td>
<td>91.66(^b)</td>
</tr>
<tr>
<td>13. Understand international trade agreements</td>
<td>76.92</td>
</tr>
<tr>
<td>14. Have knowledge of United States policies affecting global agriculture</td>
<td>76.92(^a)</td>
</tr>
<tr>
<td>15. Knowledge of agricultural education in international settings</td>
<td>76.92(^a)</td>
</tr>
<tr>
<td>16. Have knowledge about the culture of at least one other country</td>
<td>76.92(^a)</td>
</tr>
<tr>
<td>17. Have knowledge of the major subcultures in the United States</td>
<td>76.92(^a)</td>
</tr>
<tr>
<td>18. Understand the role that religion plays in politics, production practices, customs, and cultures</td>
<td>76.92(^a)</td>
</tr>
<tr>
<td>19. Have knowledge of global agricultural corporations</td>
<td>69.23(^ab)</td>
</tr>
<tr>
<td>20. Be aware that cultural differences does not make a person wrong, bad, an enemy, or stupid</td>
<td>66.66(^ab)</td>
</tr>
<tr>
<td>21. Understand agriculture from multi-cultural perspectives</td>
<td>66.66(^ab)</td>
</tr>
<tr>
<td>22. Understand aspects of global climate change likely to impact agricultural and food production worldwide</td>
<td>66.66(^ab)</td>
</tr>
<tr>
<td>23. Be open-minded</td>
<td>53.84</td>
</tr>
<tr>
<td>24. Understand the biological, social, and emotional similarities of people throughout the world</td>
<td>53.84</td>
</tr>
</tbody>
</table>

\(^a\) Reworded after Round 2. \(^b\) Only 12 panelists responded to this competency
Table 2
Descriptive Statistics of Experiences by Delphi Round 1 and 2

<table>
<thead>
<tr>
<th>Experiences Identified in Round 1 or 2</th>
<th>Round 2 ((n = 12))</th>
<th>Agree/Strongly Agree %</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Interact with people working in the international agricultural field</td>
<td>91.66</td>
<td></td>
</tr>
<tr>
<td>2. Interact with agricultural students in another country (using a variety of technologies)</td>
<td>83.33</td>
<td></td>
</tr>
<tr>
<td>3. Complete training on how to use a globalized curriculum</td>
<td>83.33</td>
<td></td>
</tr>
<tr>
<td>4. Complete an international agricultural course</td>
<td>75.00</td>
<td></td>
</tr>
<tr>
<td>5. Interact with international students on campus</td>
<td>75.00</td>
<td></td>
</tr>
<tr>
<td>6. Complete a short term study tour abroad in agriculture</td>
<td>66.66</td>
<td></td>
</tr>
<tr>
<td>7. Complete a multi-cultural/diversity course</td>
<td>66.66</td>
<td></td>
</tr>
<tr>
<td>8. Complete a course that focuses on the global economy</td>
<td>66.66</td>
<td></td>
</tr>
<tr>
<td>9. Interact with international faculty on campus</td>
<td>66.66</td>
<td></td>
</tr>
<tr>
<td>10. Interact with people of different cultures</td>
<td>66.66</td>
<td></td>
</tr>
<tr>
<td>11. Teach others about international agriculture and globalization</td>
<td>66.66</td>
<td></td>
</tr>
<tr>
<td>12. Have an International experience of any type</td>
<td>58.33</td>
<td></td>
</tr>
<tr>
<td>13. Complete an American history course</td>
<td>58.33</td>
<td></td>
</tr>
<tr>
<td>14. Take a virtual field trip</td>
<td>58.33</td>
<td></td>
</tr>
<tr>
<td>15. Complete a world history course</td>
<td>41.66</td>
<td></td>
</tr>
<tr>
<td>16. Complete an international agricultural internship</td>
<td>25.00</td>
<td></td>
</tr>
<tr>
<td>17. Complete a semester long study abroad in agriculture</td>
<td>25.00</td>
<td></td>
</tr>
<tr>
<td>18. Complete a concentration of study in a particular region of the world</td>
<td>16.66</td>
<td></td>
</tr>
</tbody>
</table>

**Round 2**

In Round 2, the panelists were given the opportunity to identify their level of agreement for each competency and experience identified through Round 1 of the study. Panelists rated each item using a five-point rating scale. Panelists were also given the opportunity to reword items or suggest additional items to the competency and/or experience list. As previously mentioned, it was determined *a priori* that competencies and experiences with at least two-thirds of the panelists choosing agree or strongly agree would move on to round three. Round 2 results for competencies are presented in Table 1 and Round 2 results for experiences are presented in Table 2. Based on the results, the competency *be open minded* was dropped after Round 2 because less than two-thirds of the panelists agreed or strongly agreed with the competency.

Based on feedback from the panel, seven experiences were also dropped after Round 2 due to having less than two-thirds of the panelists agree or strongly agree with the experience: (a) *Have an International experience of any type*, (b) *Complete an international agricultural internship*, (c) *Complete a semester long study abroad in agriculture*, (d) *Complete a world history course*, (e) *Take a virtual field trip*, (f) *Complete a concentration of study in a particular region of the world*, and (g) *Complete a world history course*. Panelists suggested that two additional competencies be added for consideration in Round 3: (a) *Describe the nutritional needs of individuals as it relates to protein needs, vitamins/minerals, carbohydrates, etc.* and (b) *Discuss how human nutritional needs relate to the commodities raised in the various regions of the world*. Thus, 24 competencies and 11 experiences moved on to Round 3.

**Round 3**

In Round 3, panelists were asked to agree or disagree with each competency and experience that made it to the final round. As mentioned before, it was determined *a priori* that competencies and experiences with a minimum of 80% panelist agreement would be retained. Complete
results for competencies are presented in Table 3 and experiences are presented in Table 4. Panelists came to consensus on 20 competencies. The following four competencies were dropped after Round 3: (a) Describe agricultural education in international settings, (b) Identify major subcultures in the United States, (c) Discuss aspects of global climate change likely to impact agricultural and food production worldwide, and (d) Describe the nutritional needs of individuals as it relates to protein needs, vitamins/minerals, carbohydrates, etc. Interestingly, panelists came to consensus on only 2 out of the 11 experiences, Interact with people working in the international agricultural field and Complete training on how to use a globalized curriculum.

Table 3
Descriptive Statistics of Competencies for Delphi Round 3 (n=12)

<table>
<thead>
<tr>
<th>Competencies</th>
<th>Agree %</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Describe the relationships between local agricultural production and the global agricultural economy</td>
<td>100.00</td>
</tr>
<tr>
<td>2. Describe the global interconnectedness of agricultural production systems (e.g. sources of production inputs such as seed, seedstock, fertilizer, livestock breedstock, etc.)</td>
<td>100.00</td>
</tr>
<tr>
<td>3. Describe the connection between the global economy and United States economy</td>
<td>100.00</td>
</tr>
<tr>
<td>4. Describe the relationship between food security, national security, and political/cultural stability</td>
<td>100.00</td>
</tr>
<tr>
<td>5. Identify international issues that affect agriculture</td>
<td>100.00</td>
</tr>
<tr>
<td>6. Describe how U.S. policies affect global agriculture</td>
<td>100.00</td>
</tr>
<tr>
<td>7. Describe the role of agriculture in developing countries</td>
<td>100.00</td>
</tr>
<tr>
<td>8. Explain the importance of global agriculture</td>
<td>100.00</td>
</tr>
<tr>
<td>9. Explain how agricultural commodities are traded internationally</td>
<td>91.66</td>
</tr>
<tr>
<td>10. Describe how domestic and international agencies affect agricultural trade</td>
<td>91.66</td>
</tr>
<tr>
<td>11. Discuss cultural differences including religion, language, customs, and food</td>
<td>91.66</td>
</tr>
<tr>
<td>12. Describe the culture of at least one other country</td>
<td>91.66</td>
</tr>
<tr>
<td>13. Recognize that cultural differences do not make a person wrong, bad, an enemy, or stupid</td>
<td>91.66</td>
</tr>
<tr>
<td>14. Discuss agriculture from multi–cultural perspectives</td>
<td>91.66</td>
</tr>
<tr>
<td>15. Describe agricultural production and commodities in major world regions</td>
<td>83.33</td>
</tr>
<tr>
<td>16. Describe international trade agreements</td>
<td>83.33</td>
</tr>
<tr>
<td>17. Identify major global agricultural corporations</td>
<td></td>
</tr>
<tr>
<td>18. Describe the role that religion plays in politics, production practices, customs, and cultures</td>
<td>83.33</td>
</tr>
<tr>
<td>19. Discuss their knowledge of world geography</td>
<td>83.33</td>
</tr>
<tr>
<td>20. Discuss how human nutritional needs relate to the commodities raised in the various regions of the world</td>
<td>83.33</td>
</tr>
<tr>
<td>21. Describe agricultural education in international settings</td>
<td>75.00</td>
</tr>
<tr>
<td>22. Identify major subcultures in the United States</td>
<td>75.00</td>
</tr>
<tr>
<td>23. Discuss aspects of global climate change likely to impact agricultural and food production worldwide</td>
<td>66.66</td>
</tr>
<tr>
<td>24. Describe the nutritional needs of individuals as it relates to protein needs, vitamins/minerals, carbohydrates, etc</td>
<td>58.33</td>
</tr>
</tbody>
</table>

*New competency added after Round 2
Table 4
Descriptive Statistics of Experiences for Delphi Round 3 (n=12)

<table>
<thead>
<tr>
<th>Experiences</th>
<th>Agree %</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Complete training on how to use a globalized curriculum</td>
<td>100.00a</td>
</tr>
<tr>
<td>2. Interact with people working in the international agricultural field</td>
<td>81.81a</td>
</tr>
<tr>
<td>3. Interact with international faculty on campus</td>
<td>75.00</td>
</tr>
<tr>
<td>4. Interact with people of different cultures (using a variety of technologies)</td>
<td>72.72a</td>
</tr>
<tr>
<td>5. Interact with agricultural students in another country</td>
<td>72.72a</td>
</tr>
<tr>
<td>6. Complete a short term study tour abroad in agriculture</td>
<td>66.66</td>
</tr>
<tr>
<td>7. Complete an international agricultural course</td>
<td>66.66</td>
</tr>
<tr>
<td>8. Complete a course that examines working in a multi-cultural environment</td>
<td>66.66</td>
</tr>
<tr>
<td>9. Complete a course that focuses on the global economy</td>
<td>66.66</td>
</tr>
<tr>
<td>10. Interact with international students on campus</td>
<td>66.66</td>
</tr>
</tbody>
</table>

*a Only 11 panelists responded to this experience

Conclusions, Discussion, and Implications

Agricultural teacher educators who participated on the expert panel came to a consensus that pre–service agricultural educators need 20 competencies and 2 experiences in order to teach a globalized curriculum at the high school level. The data collected from this study indicated that the number of competencies by pre–service agricultural educators to teach globalized curricula in the high school exceeded the number of experiences needed. The 20 competencies (see Table 3) could be categorized as competencies related to agricultural production, economics, political/policy, and social/cultural. One experience (Complete training on how to use a globalized curriculum) focused on pedagogical development, the other (Interact with people working in the international agricultural field) focused on developing knowledge based on the experiences of others.

The competencies identified support and expand the Longview Foundation’s characteristics of a globally competent student (2008). A globally competent student is able to “describe a body of knowledge about world regions, cultures, and global issues, and skills and dispositions to engage responsibly and effectively in a global environment” (Longview Foundation, 2008, p. 7). The findings in the current study add an agricultural context to the previously identified characteristics of a globally competent student. However, the panelist rejected the experiences that required the pre–service agricultural educators to interact with people of different cultures. It is interesting to think about why the panelists disregarded the experience. Merryfield (2000) found that cultural interaction for teacher educators was an important experience to have. Why are cultural interactions an important experience for teacher educators and not pre–service agricultural educators? Another experience not deemed necessary was a study-abroad experience for pre–service agricultural educators. This finding was inconsistent with the National Research Council (2009), which advocated international experiences for all agricultural students.

To allow pre–service agricultural educators to construct (Doolittle & Camp, 1999; Fosnot, 1996; Ormrod, 2008; Roberts, 2006; Steffe & Gale, 1995) their understanding of teaching globalized agriculture curricula, the context and content (Cruickshank, 1984) of agricultural education programs should be adjusted to include the competencies and experiences identified in this study. This may include changing degree requirements, redesigning courses, and/or developing curricula training sessions. Exposing the pre–service teachers to the globalized competencies and experience will allow students’ to organize the competencies and experiences in a way that allows them to construct knowledge (Ormrod, 2008).

Given the espoused emphasis on experiential learning in agricultural education (Roberts & Harlin, 2007), it is interesting to speculate why the panel failed to agree on so many of the pro-
posed experiences. One panelist offered some insight into his rationale. He suggested that each of the proposed experiences is valuable, but all of them are not realistic and are not needed to effectively teach globalized curricula (R. Terry, personal communication, July 26, 2011). Although it cannot be certain if all the panelists thought the same way, it would appear that the pragmatic nature of agricultural teacher educators trumped the desire to include more experiential activities.

This study is just beginning to fill this gap in the knowledge base. Further research in this area is needed in order to continue the development of a theoretical base for the competencies and experiences needed by pre-service agricultural educators in order to teach globalized curricula. Additionally, further research is necessary to address the following questions:

1. To what extent are pre-service agricultural educators across the nation developing the identified global competencies and having the identified experiences during their teacher preparation program?
2. What method or methods can be implemented to effectively and efficiently develop these competencies and provide these experiences?
3. What is the student perception regarding the identified global competencies and experiences?
4. Are some of the identified global competencies and experiences more important than others for pre-service agricultural educators?
5. Do the identified global competencies and experiences make pre-service agricultural educators more effective at teaching a globalized curriculum than their peers that do not possess the same competencies and experiences?

References


NATHAN W. CONNER is a Graduate Teaching/Research Assistant in the Department of Agricultural Education and Communication at the University of Florida, 310 Rolfs Hall, Gainesville, FL 32611, nathan.conner@ufl.edu.

T. GRADY ROBERTS is an Associate Professor of Agricultural Education in the Department of Agricultural Education and Communication at the University of Florida, 117C Bryant Hall, Gainesville, FL 32611, groberts@ufl.edu
Evaluating the Effectiveness of Traditional Training Methods in Non-Traditional Training Programs for Adult Learners through a Pre-test/Post-test Comparison of Food Safety Knowledge

Caleb D. Dodd
Scott Burris
Steve Fraze
David Doerfert
Abigail McCulloch
Texas Tech University

The incorporation of hot and cold food bars into grocery stores in an effort to capture a portion of the home meal replacement industry is presenting new challenges for retail food establishments. To ensure retail success and customer safety, employees need to be educated in food safety practices. Traditional methods of training are not meeting the needs of the retail food industry. Although many food safety training programs exist, few meet the educational needs of hot and cold food bar employees. In an effort to determine the effectiveness of traditional training methods for employees, a quasi-experimental study was performed. Data was collected from three separate chains within the retail food industry from six geographical locations. The pre-post assessment study utilized an interventional training and included collecting questionnaires from 300 employees. Findings of the study described characteristics of employees within each chain individually and collectively. Food safety knowledge was assessed by comparing pre-training and post-training assessments for managerial and non-managerial employees. The most important finding for this study was determining the change in essential food safety knowledge of employees after traditional food safety training was conducted for managerial employees within the treatment stores and comparing that change to the change that occurred in the control groups.

Keywords: Non-traditional training; food safety; training effectiveness; adult training.

The retail food industry is rapidly changing with new trends and practices emerging constantly (Bolton, Shankar, & Montoya, 2010). Throughout the past decade, Home Meal Replacement (HMR) has developed into a leading trend in the food service and grocery industries (Quested, Cook, Gorris, & Cole, 2010). Food service operations are competing with grocery stores for the traditional food market (Friddle, Mangaraj, & Kinsey, 2001). With the HMR trend taking over the industry, grocery stores are striving to maintain their traditional hold on the food market by developing ready-to-eat hot and cold self-service food bars (Binkley & Ghiselli, 2005).

With the addition of new products, kitchens, and procedures comes additional food safety concerns (Friddle et al., 2001). These concerns lead to a need to incorporate food safety training for the new procedures. In order to provide safe food, employees need to know how to properly prepare and maintain food for hot and cold food bars and be trained to properly use kitchen tools and equipment (McCulloch, 2009). This new market opportunity presents a need for training to ensure proper food safety practices in the hot and cold food bars within the grocery store industry.

An organized approach is necessary to identify and fulfill training needs. In 2006, organizations spent $129.6 billion dollars on training to
prepare employees for conducting their tasks. With such a sizable investment, organizations must prioritize and focus training resources where they will be most effective (Moskowitz, 2008). One way of providing this focus is through the utilization of a needs assessment. A needs assessment is the process of identifying needs, prioritizing them, making needs-based decisions, allocating resources, and implementing actions in organizations to resolve problems underlying important needs (Altschuld & Kumar, 2010). Moskowitz (2008) found that the most efficient way to collect data for a training needs assessment is through surveys. However, employee behavior can also be observed in the working environment to provide usable data for the assessment. In addition, tests can be administered employees to assess job knowledge (Moskowitz, 2008).

There are many methods for conducting a needs assessment. In 1984, Witkin developed a process model that contained three phases and emphasized three levels of need (Altschuld & Kumar, 2010). Since then, Altschuld and Kumar (2010) have revised the model.

Phase I of the needs assessment model consists of becoming organized and focusing on potential areas of concern. This includes exploring literature and research to determine what is already available and its level of success as it relates to the specified focus of each employer. Phase I is a critical building block of a needs assessment as it leads to a wealth of information about the areas of concern. The purpose of this phase is to take advantage of existing data (Altschuld & Kumar, 2010). Previous literature of training strategies and programs within the grocery industry was researched to complete Phase I of the needs assessment.

Phase II deals with gathering new information based on what has not been discovered in Phase I. Phase II involves determining initial needs, prioritizing these needs, and analyzing their possible solution strategies. Phase II often requires an extensive investment of time, personnel, and resources for the collection of new data (Altschuld & Kumar, 2010). A pre-test/post-test study was conducted to create a wealth of new data to complete Phase II of the needs assessment.

Designing and implementing solutions for high-priority needs and evaluating the results of the needs assessment process constitute Phase III. Evaluation of the process generally is not done but should be completed as part of organizational development and change (Altschuld & Kumar, 2010). Recommendations were made for future training programs to complete Phase III of the needs assessment.

Despite the success, there have been many challenges for grocery stores that serve HMRs, including time, labor, and food safety risks. The intricate food structure, employee turnover, and food pathogens are hampering the safety efforts that supermarkets utilize in the United States (Binkley & Ghiselli, 2005). Even if perfect production and distribution practices are followed, consumers may not follow safe-handling procedures (Reyes, 2002). This knowledge combined with the fact that many grocery stores are adding kitchens and unfamiliar equipment and processes to their businesses forces grocery stores to be more focused on food safety practices and train their employees to handle food safely (Binkley & Ghiselli, 2005).

Effective food safety plans and well-trained staff can help prevent an unwanted outbreak of foodborne illness. As the complexity of the food distribution and retailing system increases, the need for more stringent food safety controls and training increases as well. Food safety training and certification are a crucial part of any food safety plan (Drummer, 1998). Implementing an effective food safety training program for employees, applying a sanitation program, and designing a crisis plan in the case of a foodborne illness outbreak are evident needs in the HMR market (Binkley & Ghiselli, 2005).

There are many barriers to implementing effective food safety training for employees. A small staff base, employee turnover, lack of time, cost, a lack of suitable courses, and inflexibility of courses were reported as the most common barriers when attempting to provide effective training for supermarket employees (Worsfold, 2005). Some researchers suggest that food safety training is effective, but others find no improvement in food safety practices after training employees (York et al., 2009).

Worsfold (2005) found that effective training did not appear to be on the agenda of priori-
ties for many food managers. Some managers in
the study viewed training as an operating ex-
 pense and did not realize the benefits. Due to
low cost and convenience, on-the-job training
was the most common type of training within
the food service industry (Worsfold, 2005). This
type of training can produce negative results
including poorly trained employees who use
dangerous or ineffective methods to produce
food products (Worsfold, 2005).

Purpose and Objectives

The purpose of this study was to determine
the effectiveness of commonly used training
methods within a non-traditional learning pro-
gram. Food safety is a major concern that is
continually faced by grocery stores and other
food providers (Binkley & Ghiselli, 2005). Food
workers’ improper preparation procedures are
the most prominent cause of foodborne illness
outbreaks (Foodborne Illness, 2010). Effective
training is needed to allow for grocery store em-
ployees to prepare and serve food in a manner
that is safe and foodborne illness free.

This study is directly related to the fourth
(Examine appropriate non-formal educational
delivery systems) and fifth (Identify and use
evaluation systems to assess program impact)
research priority areas of Agricultural Education
in Domestic and International Settings: Exten-
sion and Outreach of the National Research
Agenda for Agricultural Education and Commu-
nication. In order to successfully complete this
study, objectives were determined to identify the
effectiveness of traditional training methods
within stores by transferring knowledge from
managerial employees to non-managerial em-
ployees. This needs assessment was guided by
two research objectives:

1. Describe characteristics of managerial
 and non-managerial individuals em-
 ployed within the hot and cold self-
 service food bars of grocery stores.

2. Assess the change in food safety
 knowledge of stores between pre-
 assessment and post-assessment.

Methods and Procedures

The research design for this study was qua-
si-experimental. This type of experiment lacks
random assignment but can yield useful
knowledge if it is carefully designed (Gall, Gall,
& Borg, 2007). The study contained an educa-
tion intervention. Initial assessment was pre-
test, followed by a traditional food safety train-
ing program, then followed by a post-test as-
essment. The effectiveness of the training pro-
gram and the transfer of information from man-
gerial employees to non-managerial employees
were determined through differences in the pre-
training questionnaires and post-training ques-
tionnaires.

With the intention of developing a comput-
er-based training program for hot and cold self-
service food bars in the grocery store industry,
the United States Department of Agriculture
(USDA) funded a research grant through the
International Center for Food Industry Excel-
lence (ICFIE). Three grocery chain retail food
providers agreed to participate in the collabora-
tive project. The chains span six geographical
regions within five states. In order to properly
assess the effectiveness of food safety training it
was determined that both managerial and non-
managerial employees should be included in the
study. The target population included employ-
ees that worked in the hot and cold self-serve
food bar department of grocery stores. The
sampling technique used for this study was non-
probabilistic purposive.

The grocery chains agreed to allow one
managerial employee and two non-managerial
employees to complete a written questionnaire.
Following the initial data collection period,
managerial employees from randomly selected
stores participated in an interventional food sa-
fty training program presented in a traditional
classroom method. The stores not selected were
identified as a control group, while the stores
participating in the training were identified as
the treatment group. The interventional food
safety training the managerial employees re-
ceived was presented by professionals using cer-
tification curriculum. Post-training data was
collected no less than 30 days later, this period
of time gave managerial employees time to
transfer new knowledge to non-managerial em-
ployees within the stores. Post-training data included the same questionnaire, again targeting one managerial employee and two non-managerial employees. After the collection of the data, analysis was performed to identify what effects the training had on the stores’ food safety knowledge collectively.

The accessible sample for the needs assessment consisted of 44 stores from three grocery chains in five states who offered hot and cold self-service food bars for customers. The 44 stores were represented by 300 questionnaires. Fifty-six managerial employees and 113 non-managerial employees participated in the pre-assessment of food safety knowledge, whereas 43 managerial employees and 88 non-managerial employees participated in the post-training questionnaire. The sampling technique was non-probabilistic. Results of this study cannot be generalized to a larger population due to the fact that the sample was purposively selected by the chains upper management. However, the sampling technique does allow for adequate needs assessment to be performed.

The instrument used for this study was a Food Safety Questionnaire developed for a pre-assessment to develop a food safety training program (McCulloch, 2009). The questionnaire consisted of five sections. The questionnaire was developed in both English and Spanish. As reported by McCulloch, the content and validity of the instrument used for this study was established by a panel of experts. McCulloch reported the Kuder-Richardson 20 coefficient was 0.51. This is relatively low, but acceptable value for the Kuder-Richardson (Nunnally, 1967).

Two different modes were used for collecting data from employees. An online instrument was initially developed for the delivery of the questionnaire; a paper booklet was then designed to accommodate individuals without access to internet connections. The collection of pre-test and post-test data spanned 15 months. The study was designed to offset data collection between chains to reduce the number of personnel used data collection. Data from each chain was collected within a 200-day period.

Data was entered and analyzed using the Statistical Package for Social Sciences (SPSS) 16.0 computer program for Microsoft Windows. Microsoft Excel 2007 was used for calculating scores. Descriptive data for objective one was reported using frequencies, percentages, means, and standard deviations. In analyzing data for objective two, 16 questions from section two of the questionnaire were used to determine food safety knowledge scores. Each participant received a percentage score representing the number of questions the individual answered correctly out of the 16 possible. Objective two assessed the change between pre-training food safety knowledge and post-training food safety knowledge of employees.

**Findings**

Managerial employees’ data were analyzed separately from non-managerial employee data as statistical comparison between the two groups were not suitable. The findings are presented by each chain individually and from all stores cumulatively. Table 1 provides a summary of the number of participants by chain for each phase of data collection.
Table 1
Summary of Number of Participants by Employment Type, Location, and Administration

<table>
<thead>
<tr>
<th>Participants (N)</th>
<th>Chain I</th>
<th>Chain II</th>
<th>Chain III</th>
<th>Cumulative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stores</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control Group</td>
<td>9</td>
<td>7</td>
<td>8</td>
<td>24</td>
</tr>
<tr>
<td>Treatment Group</td>
<td>6</td>
<td>8</td>
<td>6</td>
<td>20</td>
</tr>
<tr>
<td>Total</td>
<td>15</td>
<td>15</td>
<td>14</td>
<td>44</td>
</tr>
<tr>
<td>Managerial Employees</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre-Training Control</td>
<td>8</td>
<td>9</td>
<td>12</td>
<td>29</td>
</tr>
<tr>
<td>Post-Training Control</td>
<td>9</td>
<td>12</td>
<td>6</td>
<td>27</td>
</tr>
<tr>
<td>Pre-Training Treatment</td>
<td>8</td>
<td>10</td>
<td>9</td>
<td>27</td>
</tr>
<tr>
<td>Post-Training Treatment</td>
<td>5</td>
<td>9</td>
<td>2</td>
<td>16</td>
</tr>
<tr>
<td>Total</td>
<td>30</td>
<td>40</td>
<td>29</td>
<td>99</td>
</tr>
<tr>
<td>Non-managerial Employees</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre-Training Control</td>
<td>23</td>
<td>16</td>
<td>18</td>
<td>57</td>
</tr>
<tr>
<td>Post-Training Control</td>
<td>20</td>
<td>17</td>
<td>11</td>
<td>48</td>
</tr>
<tr>
<td>Pre-Training Treatment</td>
<td>23</td>
<td>16</td>
<td>17</td>
<td>56</td>
</tr>
<tr>
<td>Post-Training Treatment</td>
<td>11</td>
<td>18</td>
<td>11</td>
<td>40</td>
</tr>
<tr>
<td>Total</td>
<td>77</td>
<td>67</td>
<td>57</td>
<td>201</td>
</tr>
</tbody>
</table>

Objective one sought to describe the employees participating in the study. This section described the demographic characteristics of the participants along with their retail food experience and experiences in food safety training. The average age of the participants and their average number of years in the retail food industry are presented in Table 2. The mean age of managerial employees in the study was 39 (SD=9.2) while non-managerial employees’ average age was slightly younger (M=38) with a higher level of variance (SD=13.8). The average number of years in the industry for managerial employees was 10 years (SD=7.0). The average for non-managerial employees in the retail food industry was six years (SD=6.2).

Table 2
Participants’ Ages and Years of Experience

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Chain I</th>
<th>Chain II</th>
<th>Chain III</th>
<th>Grand Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>Managerial Employees</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>41</td>
<td>10.6</td>
<td>40</td>
<td>8.9</td>
</tr>
<tr>
<td>Years in Industry</td>
<td>8</td>
<td>8.4</td>
<td>11</td>
<td>7.2</td>
</tr>
<tr>
<td>Non-managerial Employees</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>39</td>
<td>16.4</td>
<td>36</td>
<td>12.7</td>
</tr>
<tr>
<td>Years in Industry</td>
<td>5</td>
<td>6.1</td>
<td>6</td>
<td>6.7</td>
</tr>
</tbody>
</table>
Gender, current positions held, and levels of education for the managerial employees are reported in Table 3. Just over half the managerial employees were female (n=50). Fifty-five percent (n=55) of managerial employees in the study reported being their stores’ department manager. The level of education of the managerial employees varied from 21.2% of participants (n=21) reporting having some high school to 11.1% of participants (n=11) having earned a bachelor’s degree. Almost half of the managerial employees reported either a high school diploma or some high school being their highest level of education.

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Chain I</th>
<th>Chain II</th>
<th>Chain III</th>
<th>Cumulative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>14</td>
<td>46.7</td>
<td>26</td>
<td>65.0</td>
</tr>
<tr>
<td>Male</td>
<td>13</td>
<td>43.3</td>
<td>14</td>
<td>35.0</td>
</tr>
<tr>
<td>Undisclosed</td>
<td>3</td>
<td>10.0</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>Position</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Department Manager</td>
<td>19</td>
<td>63.3</td>
<td>22</td>
<td>55.0</td>
</tr>
<tr>
<td>Department Head</td>
<td>2</td>
<td>6.7</td>
<td>4</td>
<td>10.0</td>
</tr>
<tr>
<td>Co-Manager</td>
<td>3</td>
<td>10.0</td>
<td>2</td>
<td>5.0</td>
</tr>
<tr>
<td>Other title</td>
<td>6</td>
<td>20.0</td>
<td>12</td>
<td>30.0</td>
</tr>
<tr>
<td>Education</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Some High School</td>
<td>10</td>
<td>33.3</td>
<td>9</td>
<td>22.5</td>
</tr>
<tr>
<td>High School Diploma</td>
<td>5</td>
<td>16.7</td>
<td>12</td>
<td>30.0</td>
</tr>
<tr>
<td>Some Culinary/Tech</td>
<td>6</td>
<td>20.0</td>
<td>3</td>
<td>7.5</td>
</tr>
<tr>
<td>Graduate Culinary/Tech</td>
<td>2</td>
<td>6.7</td>
<td>4</td>
<td>10.0</td>
</tr>
<tr>
<td>Associate’s Degree</td>
<td>5</td>
<td>16.6</td>
<td>6</td>
<td>15.0</td>
</tr>
<tr>
<td>Bachelor’s Degree</td>
<td>2</td>
<td>6.7</td>
<td>6</td>
<td>15.0</td>
</tr>
</tbody>
</table>

The same information provided for managerial employees in Table 3 was provided for non-managerial employees in the study in Table 4. Unlike the managerial employees, who were relatively even in the female-to-male ratio, females accounted for 68.1% (n=137) of all the non-managerial employees participating in the study. Although 21.4% (n=43) of the non-managerial employees reported holding positions with titles, the vast majority, 78.6% (n=158) reported being an hourly employee or some other title. The level of education did fluctuate from percentages reported by managerial employees. However, the most frequent responses remained the same with 65 (32.3%) of the non-managerial employees reporting a high school diploma as the highest level of education and some high school accounting for 28.9% (n=58).
Table 4
Non-managerial Employees’ Gender, Position, and Education Level

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Chain I</th>
<th>Chain II</th>
<th>Chain III</th>
<th>Cumulative</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>f</td>
<td>%</td>
<td>f</td>
<td>%</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>52</td>
<td>67.5</td>
<td>46</td>
<td>68.7</td>
</tr>
<tr>
<td>Male</td>
<td>20</td>
<td>26.7</td>
<td>20</td>
<td>29.9</td>
</tr>
<tr>
<td>Undisclosed</td>
<td>5</td>
<td>6.5</td>
<td>1</td>
<td>1.5</td>
</tr>
<tr>
<td>Position</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shift Leader</td>
<td>3</td>
<td>3.9</td>
<td>12</td>
<td>17.9</td>
</tr>
<tr>
<td>Department Head</td>
<td>2</td>
<td>2.6</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>Assistant Head</td>
<td>5</td>
<td>6.5</td>
<td>8</td>
<td>11.9</td>
</tr>
<tr>
<td>Hourly Employee</td>
<td>61</td>
<td>79.2</td>
<td>44</td>
<td>65.7</td>
</tr>
<tr>
<td>Other title</td>
<td>6</td>
<td>7.8</td>
<td>3</td>
<td>4.5</td>
</tr>
<tr>
<td>Education</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Some High School</td>
<td>27</td>
<td>35.0</td>
<td>18</td>
<td>26.9</td>
</tr>
<tr>
<td>High School Diploma</td>
<td>23</td>
<td>29.9</td>
<td>26</td>
<td>38.8</td>
</tr>
<tr>
<td>Some Culinary/Tech</td>
<td>15</td>
<td>19.5</td>
<td>10</td>
<td>14.9</td>
</tr>
<tr>
<td>Graduate Culinary/Tech</td>
<td>3</td>
<td>3.9</td>
<td>3</td>
<td>4.5</td>
</tr>
<tr>
<td>Associate’s Degree</td>
<td>5</td>
<td>6.5</td>
<td>7</td>
<td>10.4</td>
</tr>
<tr>
<td>Bachelor’s Degree</td>
<td>4</td>
<td>5.2</td>
<td>3</td>
<td>4.5</td>
</tr>
</tbody>
</table>

Methods of training received and time spent training for managerial employees are displayed in Table 5. When responding to methods of training received, participants were encouraged to answer all that applied to their individual experience.

Table 5
Managerial Employees’ Experience with Food Safety Training

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Chain I</th>
<th>Chain II</th>
<th>Chain III</th>
<th>Cumulative</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>f</td>
<td>%</td>
<td>f</td>
<td>%</td>
</tr>
<tr>
<td>Method of Training</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Classroom</td>
<td>17</td>
<td>56.8</td>
<td>39</td>
<td>97.5</td>
</tr>
<tr>
<td>On-the-job</td>
<td>20</td>
<td>66.7</td>
<td>15</td>
<td>37.5</td>
</tr>
<tr>
<td>Textbook</td>
<td>8</td>
<td>26.7</td>
<td>11</td>
<td>27.5</td>
</tr>
<tr>
<td>Video</td>
<td>9</td>
<td>30.0</td>
<td>15</td>
<td>37.5</td>
</tr>
<tr>
<td>Computer-based</td>
<td>24</td>
<td>80.0</td>
<td>2</td>
<td>5.0</td>
</tr>
<tr>
<td>Company-web</td>
<td>10</td>
<td>33.3</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>Internet</td>
<td>6</td>
<td>20.0</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>Time Spent Training</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>More than 3 days</td>
<td>12</td>
<td>40.0</td>
<td>4</td>
<td>10.0</td>
</tr>
<tr>
<td>2 – 3 days</td>
<td>7</td>
<td>23.3</td>
<td>24</td>
<td>60.0</td>
</tr>
<tr>
<td>1 day</td>
<td>3</td>
<td>10.0</td>
<td>2</td>
<td>5.0</td>
</tr>
<tr>
<td>6 – 12 hours</td>
<td>3</td>
<td>10.0</td>
<td>6</td>
<td>15.0</td>
</tr>
<tr>
<td>Less than 5 hours</td>
<td>5</td>
<td>16.7</td>
<td>4</td>
<td>10.0</td>
</tr>
</tbody>
</table>

Classroom training, accounting for 82.8% (n=82), was the most common method reported by managerial employees. It was also the most frequent response in two of the three chains. Eighty percent of managerial employees (n=24) in Chain I reported computer-based training to be most prominent. Only two managerial employees (5.0%) in Chain II and three managerial employees (10.3%) in Chain III re-
ported utilizing computer-based training. Although city and state certification appeared to be the most popular training certification with 48.8% \((n=49)\), it was less than half of the most frequent response in two of the three chains. Fifty-two managerial employees (52.5%) reported spending between two and three days in food safety training. Two to three days training was also the majority in Chain II and Chain III; however, 40% \((n=12)\) of managerial employees in Chain I reported spending more than three days in food safety training. Methods of training and time spent training for non-managerial employees are described in Table 6.

Table 6  
Non-managerial Employees’ Experience with Food Safety Training  

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Chain I</th>
<th>Chain II</th>
<th>Chain III</th>
<th>Cumulative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Method of Training</td>
<td>F</td>
<td>%</td>
<td>f</td>
<td>%</td>
</tr>
<tr>
<td>Classroom</td>
<td>13</td>
<td>16.9</td>
<td>51</td>
<td>76.1</td>
</tr>
<tr>
<td>On-the-job</td>
<td>53</td>
<td>68.8</td>
<td>44</td>
<td>65.7</td>
</tr>
<tr>
<td>Textbook</td>
<td>15</td>
<td>19.5</td>
<td>11</td>
<td>16.4</td>
</tr>
<tr>
<td>Video</td>
<td>34</td>
<td>44.2</td>
<td>25</td>
<td>37.3</td>
</tr>
<tr>
<td>Computer-based</td>
<td>46</td>
<td>59.7</td>
<td>1</td>
<td>1.5</td>
</tr>
<tr>
<td>Company-web</td>
<td>13</td>
<td>16.9</td>
<td>1</td>
<td>1.5</td>
</tr>
<tr>
<td>Internet</td>
<td>3</td>
<td>3.9</td>
<td>2</td>
<td>3.0</td>
</tr>
<tr>
<td>Time Spent Training</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>More than 3 days</td>
<td>12</td>
<td>15.6</td>
<td>7</td>
<td>10.4</td>
</tr>
<tr>
<td>2 – 3 days</td>
<td>11</td>
<td>14.3</td>
<td>22</td>
<td>32.8</td>
</tr>
<tr>
<td>1 day</td>
<td>14</td>
<td>18.2</td>
<td>11</td>
<td>16.4</td>
</tr>
<tr>
<td>6 – 12 hours</td>
<td>2</td>
<td>2.6</td>
<td>7</td>
<td>10.4</td>
</tr>
<tr>
<td>Less than 5 hours</td>
<td>38</td>
<td>49.3</td>
<td>20</td>
<td>30.0</td>
</tr>
</tbody>
</table>

Unlike the responses given by the managerial employees, the method of training most frequently used, as reported by non-managerial employees, was on-the-job training by 67.2% \((n=135)\). Chain II and Chain III aligned more closely to the numbers reported by managerial employees. The most frequent method of training for these chains was classroom training by 76.1% \((n=51)\) for Chain II and 70.2% \((n=40)\) for Chain III. At 59.7% \((n=46)\), more than half of Chain I non-managerial employees reported participating in computer-based training. Like managerial employees from Chain II and Chain III, only one non-managerial employee from Chain II (1.5%) and 12 non-managerial employees from Chain III (21.1%) reported using computer-based training. The amount of time spent training also differed from responses given by managerial employees. The most frequent response given by non-managerial employees was less than five hours with 33.3% \((n=67)\). Two to three days was the second most frequent overall and the most frequent in Chain II with 32.8% \((n=22)\) and Chain III with 42.1% \((n=24)\).

Objective two assessed the change in food safety knowledge of employees from the pre-assessment to the post-assessment. Food safety knowledge was assessed through 16 multiple choice items developed specifically to test the essential knowledge of employees within the hot and cold self-service food bar sectors of grocery stores. Each participant was given a score based on the percentage of items they answered correctly out of the 16 questions. Scores were averaged among the control groups and treatment groups for both pre-training and post-training assessments for each chain individually and cumulatively. Changes in scores were calculated for each category of participants.

The difference in percentage scores were used for comparing and identifying changes between pre-training and post-training performance. There are many different levels of pre-training food safety knowledge scores reported in this section. Knowledge scores that are high in the pre-training assessment do not leave as large of a window for improvement to occur. Identifying the changes in scores allowed
post-training scores represents the change in food safety knowledge that occurred over time between the collections of the data. The control group received no additional treatment between the assessments of knowledge, whereas managerial employees in the treatment group participated in interventional training for food safety.

Table 7
Change in Food Safety Knowledge Scores for Managerial Employees

<table>
<thead>
<tr>
<th>Knowledge</th>
<th>Chain I</th>
<th>Chain II</th>
<th>Chain III</th>
<th>Cumulative</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>C</td>
<td>T</td>
<td>C</td>
<td>T</td>
</tr>
<tr>
<td>Pre-Training</td>
<td>68.8</td>
<td>68.0</td>
<td>81.3</td>
<td>83.8</td>
</tr>
<tr>
<td>Post-Training</td>
<td>70.8</td>
<td>75.0</td>
<td>79.2</td>
<td>81.3</td>
</tr>
<tr>
<td>Difference in Scores</td>
<td>2.0</td>
<td>7.0</td>
<td>(2.1)</td>
<td>(2.5)</td>
</tr>
</tbody>
</table>

Note. C=Control Group, T=Treatment Group

Cumulatively, the control group had lower pre-training (71.3%) and post-training (75.9%) scores than the treatment group (74.8%, 79.3%). However, the difference in the amount of change that occurred over time between both groups was one-tenth of a percent. Chain I’s pre-training scores were extremely close (68.8%, 68.0%), but a 7.0% increase occurred in the treatment group as opposed to the 2.0% increase that was seen in the control group between the pre-training and post-training assessments of knowledge. Chain II had the highest scores by far on the assessment prior to training with the control group scoring 81.3% and the treatment group scoring 83.8%. Chain II also had a negative change in knowledge with both groups dropping in their average scores by 2.1% (control) and 2.5% (treatment). Although Chain II had a decrease in scores, the percentage of correct answers on the post-training assessment remained the top scores represented in the data (79.2%, 81.3%). Chain III’s control group started with the lowest score of 65.6%, but had the largest change of 11.0%. Chain III’s treatment group also had an increase in knowledge from 70.9% (pre-training) to 81.3% (post-training) for a change of 10.4%.

The food safety knowledge scores for non-managerial employees are reported in Table 8. The difference in the pre-training and post-training scores represents the change in food safety knowledge that occurred over time between the collections of the data. The managerial employees in the control group received no additional treatment between the assessments of knowledge; whereas, the managerial employees in the treatment group participated in interventional food safety training. Non-managerial employees received no additional training.

Table 8
Change in Food Safety Knowledge Scores for Non-managerial Employees

<table>
<thead>
<tr>
<th>Knowledge</th>
<th>Chain I</th>
<th>Chain II</th>
<th>Chain III</th>
<th>Cumulative</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>C</td>
<td>T</td>
<td>C</td>
<td>T</td>
</tr>
<tr>
<td>Pre-Training</td>
<td>62.8</td>
<td>59.0</td>
<td>75.0</td>
<td>71.5</td>
</tr>
<tr>
<td>Post-Training</td>
<td>67.8</td>
<td>66.5</td>
<td>68.0</td>
<td>65.3</td>
</tr>
<tr>
<td>Difference in Scores</td>
<td>5.0</td>
<td>7.5</td>
<td>(7.0)</td>
<td>(6.2)</td>
</tr>
</tbody>
</table>

Note. C=Control Group, T=Treatment Group
The average knowledge scores for non-managerial employees were lower than the scores reported for managerial employees across the board. Cumulatively, the non-managerial employees pre-training scores were 67.2% for the control group and 62.5% for the treatment group. A slight decrease of 0.8% was scored on the post-training score in the control group with a slight increase of 1.7% occurring in the treatment group. Chain I was only 0.2% away from having the lowest scores on the pre-training assessment and only 0.2% away from having the highest scores on the post-training assessment. Chain I had the greatest amount of change for both the control group (5.0%) and the treatment group (7.5%). Chain II had the highest scores on the pre-training assessment (75.0%, 71.5%) but, like the managerial employees, also showed the greatest decrease in knowledge scores (7.0%, 6.2%). Even with the decrease in knowledge scores, the non-managerial employees in Chain II showed some of the highest scores recorded in the post-training assessment. Chain III’s non-managerial employees showed the least amount of change from pre-training to post-training assessments. The control group’s score decreased 2.1% while the treatment group’s score increased by 1.3%.

A comparison of food safety knowledge percentage scores between managerial and non-managerial employees was conducted to assess the difference in food safety knowledge between the two groups. The pre-training and post-training food safety knowledge percentage scores are displayed in Table 9.

Table 9

<table>
<thead>
<tr>
<th>Knowledge</th>
<th>Chain I</th>
<th>Chain II</th>
<th>Chain III</th>
<th>Grand Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>C</td>
<td>T</td>
<td>C</td>
<td>T</td>
</tr>
<tr>
<td>Pre-Training</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Managerial</td>
<td>68.8</td>
<td>68.0</td>
<td>81.3</td>
<td>83.8</td>
</tr>
<tr>
<td></td>
<td>65.6</td>
<td>70.9</td>
<td>71.3</td>
<td>74.8</td>
</tr>
<tr>
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<td>59.0</td>
<td>75.0</td>
<td>71.5</td>
</tr>
<tr>
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<td>9.0</td>
<td>6.3</td>
<td>12.3</td>
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<tr>
<td>Post-Training</td>
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<td></td>
<td></td>
</tr>
<tr>
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<td>75.0</td>
<td>79.2</td>
<td>81.3</td>
</tr>
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<td>Non-managerial</td>
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<td>68.0</td>
<td>65.3</td>
</tr>
<tr>
<td>Difference</td>
<td>3.0</td>
<td>8.5</td>
<td>11.2</td>
<td>16.0</td>
</tr>
</tbody>
</table>

Note. C=Control Group, T=Treatment Group

The average scores for managerial employees in every chain was consistently higher that the non-managerial employees’ scores. In the pre-training, Chain II had the highest scores for both managerial and non-managerial employees, but also had the largest difference in scores with 6.3% in the control group and 12.3% in the treatment group. The difference in food safety knowledge scores was consistently larger in the treatment groups for the pre-training assessment. The difference of food safety knowledge scores between the managerial and non-managerial employees grew larger in every group except Chain I’s control group from the pre-training to the post-training. The gap of knowledge grew the largest in Chain III. The control group had a 2.1% difference in the pre-training and a 15.7% difference in the post-training while the treatment group went from a 12.1% difference in the pre-training to a 21.2% difference in the post-training. The overall increase in the difference in food safety knowledge scores between the managerial and non-managerial employees was 5.4% (control) and 2.8% (treatment).
Conclusions, Implications and Recommendations

The employees in this study reported a similar average age. This is most likely due to the high population of high school students mixed with the growing number of baby boomers reaching retirement age and taking part-time employment in the retail food service industry to supplement retirement funds. Managerial employees had almost twice as many years of experience in the industry than did non-managerial employees. This represents two important aspects. First, time in the industry is an important factor for promotion and career success within the industry. Second, non-managerial employees who stay in the industry for an extended period of time are likely to move into management positions. Because non-managerial employees are the ones who move into the management positions, training should be focused on all employees, not only managerial employees.

Most managerial employees in the study held positions with titles and reported a variety of educational levels from some who had only attended some high school to others who had earned bachelor degrees. The majority of non-managerial employees were on hourly employment with over 60% reporting either a high school diploma or some high school. There is a large intellectual range of participants targeted for food safety training. This finding is consistent with findings from McCulloch (2009). Over half of all the employees who participated in the study reported their highest level of education to be a high school diploma or some high school. Based on this finding, food safety training should target a junior high reading level.

Trends for methods of training and time spent training between managerial and non-managerial employees showed some similarities. Employees are accustomed to classroom and on-the-job training between two and three days. This supports findings by Kramer and Scott (2004), Worsfold (2005), and York et al., (2009). Based on results of food safety knowledge scores and number of non-managerial employees who only reported receiving on the job training, researchers can conclude that the current methods of training are not meeting the needs of the hot and cold self-service food bars, therefore, a more effective method for training employees in the retail food industry is needed.

Food safety knowledge scores prior to the interventional training were compared to the food safety knowledge scores following the training to assess the effects the interventional training had on employees’ food safety knowledge. The average food safety knowledge scores for employees in the post-training assessment for the treatment groups were lower than one might expect on an assessment of essential knowledge. This finding was consistent with the results of other food safety studies conducted by Hertzman and Barrash (2007) within other regions of the retail food industry. Managerial employees’ scores resulted in a 79% average, and carried into a 64% average for their non-managerial employees. The method of transferring knowledge to employees does not sufficiently educate participants in food safety knowledge that is necessary to ensuring food safety for hot and cold self-serve food bar sectors of grocery stores.

The average scores for the three chains cumulatively did not exhibit a large variance between the control group and the treatment group from pre-training to post-training. Managerial employees’ difference was less than a tenth of a point and non-managerial employees’ resulted in a difference of two and a half percentage points. Overall, the control groups showed a similar change in food safety knowledge as the treatment groups in the study. The traditional method of food safety training did not appear to effectively meet the educational needs of employees in the hot and cold food bars.

In addition, following the training the difference in food safety knowledge between managerial and non-managerial employees grew larger. Managerial employees were the only ones to receive the interventional training with expectations of taking the information back to the non-managerial employees. Information from the interventional training did not appear to have been distributed from the managerial employees to the non-managerial employees in an effective manner. Traditional methods of “training the trainer,” expecting information to filter down, does not meet the educational needs within the
hot and cold self-service food bar to ensure safe food for consumers.

Food safety knowledge within the grocery store industry is not at an appropriate level to meet the needs of food safety standards. McCulloch (2009) recommended that the most common methods of training, classroom and on-the-job training, be utilized to build these scores. Researchers in this study do not see these methods meeting the need and recommend that a more effective style of training be explored to promote the retention of understanding of the concepts and importance of food safety in hot and cold food self-service food bars of grocery stores.

Palvia and Palvia (2007) found that all methods of computer-based instruction led to an improvement in the skills of the participants. Macaulay and Pantazi (2006) discovered that students who used computer-based training scored significantly higher than those who used traditional methods. Van Gerven, Paas, and Tabbers (2006) found that computer-based training plays an important role in optimizing the level of cognitive load an individual is capable of processing. Based on findings of this study, computer-based curriculum will be a new method for more than half of participants.

This study identified a flaw in the traditional method of training employees in the hot and cold food bars utilizing food safety training developed for grocery stores as a whole. The study also found that managerial employees’ food safety knowledge is not effectively distributed to their non-managerial employees. All employees who work in any aspect of the hot and cold self-service food bars within the grocery stores should be required to participate in additional food safety training that focuses specifically on issues relating to hot and cold food bar food safety.

References


Student Motivation for Involvement in Supervised Agricultural Experiences: An Historical Perspective

William A. Bird
University of Nebraska-Lincoln
Michael J. Martin
Jon C. Simonsen
University of Missouri

The purpose of this study was to examine student motivation for SAEs through the lens of the Self-Determination Theory. Self-Determination Theory proposed that human beings are more genuinely motivated when driven by internal factors as opposed to external factors. We used historical research and general qualitative interpretative methods to develop an explanation of student motivation for SAEs. We examined historical magazines, documents, and books for detailed cases of SAE participation. Three specific time periods were examined: 1928-1934, 1947-1953, and 1966-1973. We found that student motivation for SAEs has been a prevailing topic since the 1920s. SAEs have typically been initiated by utilizing extrinsic motivating forces through mandating, awards, class requirements, or collaborative school projects. Although extrinsic motivation was not ideal, half of the cases studied ended with a developed internal locus of causality. This demonstrated that student motivation to participate in SAEs could be established by external motivators and later sustained by internal stimulus. We recommend that agricultural education practitioners use caution when assigning external rewards. Overuse of external rewards such as money, trophies, or recognition could potentially distort a student’s acquisition of the “true” SAE values of enhanced learning and career exploration.

Keywords: SAE, school-based agricultural education, student motivation, self-determination theory

Supervised agricultural experiences (SAEs) are intended to be an experiential learning tool for students enrolled in school-based agricultural education programs. SAEs constitute one-third of the agricultural education model and are critical to the mission of agricultural education (Moore, 1988; Phipps, Osborne, Dyer, & Ball, 2008). Through SAEs, students apply concepts learned in the classroom to real world applications (Dyer & Osborne, 1995; Dyer & Williams, 1997; Phipps et al., 2008; Talbert, Vaughn, & Croom, 2005). Agriculture teachers value the concept of SAEs but often fail to successfully implement SAEs within their programs (Dyer & Osborne, 1995; Retallick, 2010). Furthermore, student participation in SAEs has consistently declined throughout the past few decades (Dyer & Osborne, 1995; Retallick & Martin, 2005; Steele, 1997). However, the reasons for declining student participation in SAEs have not been well examined. Considering the long history and purported value of SAEs, an examination of students’ motivation over the years for SAE participation could help educators understand the trend of declining SAE participation.

Student participation in SAEs has historically been a concern of agricultural educators. To address this problem, agricultural education professionals have required agriculture students to engage in a SAE. During the early years of the agricultural education profession, federal and state governing agencies mandated student participation in SAEs (Moore, 2003; Wilson & Moore, 2007). Though SAEs are no longer federally mandated, many teachers require all students to have a SAE or maintain SAE records as a component of the curriculum (Dyer & Osborne, 1995; Retallick, 2010). Although the teacher’s intentions of requiring student SAE participation may be well intended, research in-
dicates that students can potentially develop negative attitudes towards SAEs if they are perceived as just a requirement (Schunk, Pintrich, & Meece, 2008).

Researchers have suggested declining SAE involvement is partly attributed to a lack of student motivation for SAE participation (Dyer & Osborne, 1995; Osborne, 1988). The National FFA Organization (FFA) has provided awards to stimulate student interest and participation in SAEs. By the 1940s, B. L. Bible (1941) described how the FFA degree system motivated students’ participation in SAEs. “The opportunity for degree advancement provides the single strongest drive for the boy to develop a strong supervised farm practice program…. if he works hard enough to build a record of scholarship and leadership and a long-time farming program” (p. 117). Teachers still attempt to stimulate and maintain student participation in SAEs using FFA Proficiency Award, FFA Degrees, and American Star Award programs (Bender, Taylor, Hansen, & Newcomb, 1979; National FFA Organization, 2012; Retallick, 2010; Tenney, 1977; Wilson & Moore, 2007). However, current motivational theories suggest that excessive extrinsic awards are not always an effective strategy to motivate students (Deci & Ryan, 1985a; Schunk, 2009).

Agricultural education professionals have utilized mandates and awards to stimulate and motivate student participation in SAEs. However, the problem may not be a lack of motivation—the problem could be a lack of effective motivational strategies. Existing research related to SAEs has primarily focused on the teacher’s motivation for implementing SAEs (Jenkins & Kitchel, 2009; Retallick, 2010; Robinson & Haynes, 2011; Wilson & Moore, 2007). Limited research exists to examine motivational approaches used in SAE programs and subsequent behaviors of students resulting from those motivational approaches. The continued decrease in SAE participation constitutes a problem that may be alleviated by examining how agriculture students have been effectively or ineffectively motivated to begin and continue participation in SAEs.

Purpose of the Study

We conducted a review of historical SAE literature to better understand how student motivation to initiate and participate in SAEs evolved during the first 60 years of vocational agriculture. The purpose of this study was to examine student motivation for SAEs through the lens of the Self-Determination Theory (Deci & Ryan, 1985a). Specifically, SAEs were analyzed according to the two central concepts of Self-Determination Theory: (a) regulatory styles and (b) perceived locus of causality (Ryan & Deci, 2000). This study aligns to Priority 5 of the National Research Agenda to develop highly effective agricultural education programs (Doerfert, 2011).

Theoretical Framework

Motivation is the “means to be moved to do something” (Ryan & Deci, 2000, p. 54). According to Self-Determination Theory, human behaviors are a result of motivating forces that fluctuate on a continuum. On one end of the continuum is intrinsic motivation, or being motivated by internal forces, and on the other end is extrinsic motivation, or being motivated by external forces (Schunk, Pintrich, & Meece, 2008). Self-Determination Theory proposes that human behavior is contingent on the level of choice an individual has before and during an activity. An individual will have a higher level of motivation for an activity if they believe the activity is self-directed (Deci & Ryan, 1985a). The motivating forces continuum can be further differentiated by two categories of when motivating forces can fluctuate: (a) regulatory styles and (b) perceived locus of causality (Ryan & Deci, 2000).

Regulatory Motivating Styles

Regulatory styles are the reasons or choices for beginning an action. Regulatory styles can fluctuate between highly controlled by the individual to highly uncontrolled by the individual. Regulatory styles are classified as being amotivational, extrinsic, or intrinsic to the individual (Ryan & Deci, 2000).
Amotivational regulatory styles

The antithesis of being motivated is amotivation. An individual may become amotivated when forced to participate in an activity rather than having a choice to participate in the activity. An individual may be provided with little if any decision making opportunities throughout the activity and will often maintain a low value for the activity (Schunk, Pintrich, & Meece, 2008). Amotivation regulation styles can be harmful to an individual’s emotions related to the activity at hand (Abramson, Seligman, & Teasdale, 1978; Deci & Ryan, 1985a; Ryan, 1995). An individual who experiences an amotivational regulatory style is likely to develop negative feelings towards the activity as well as other persons or institutions associated with the activity (Ryan & Deci, 2000).

Extrinsic regulatory styles

An individual is classified as being externally motivated when they are persuaded, coerced, or enticed to choose participation in an activity (Vallerand & Bissonnette, 1992). This could include an individual participating in an activity primarily to receive extrinsic rewards or to avoid extrinsic punishments. Although the individual did in fact have a choice concerning participation, the individual was externally pressured enough to lose the feeling of self-directedness (Schunk, Pintrich, & Meece, 2008). The individual may not necessarily desire to participate but is ultimately persuaded to participate based upon external consequences (Ryan & Deci, 2000). An individual will be compliant simply to receive the reward or avoid the punishment; thus, the individual’s internal value for the activity may be diminished (Schunk, Pintrich, & Meece, 2008).

Intrinsic regulatory styles

An individual is intrinsically motivated when their actions are chosen based upon their internal aspirations (Deci, 1971) that have little or no external reward or consequence (Deci & Ryan, 1987; White, 1959). Actions driven by intrinsic regulations are often used to satisfy one or more of three needs influencing human behaviors: competence, a person’s need to feel a level of confidence in themselves and their abilities; relatedness, the feeling that one belongs to a group or community; and autonomy, one’s ability to feel control, choice, or direction (Deci & Ryan, 1985a; Ryan & Deci, 2002). Intrinsic motivation is looked upon as the most powerful and fulfilling regulatory style. The individual’s decision and/or consequences of participation are based solely on that individual; the internal meaningfulness before, during, and after the activity is what causes an individual to participate (Schunk, 2009).

Perceived Locus of Causality

The second category of fluctuating motivational factors is the perceived locus of causality (Ryan & Deci, 2000). Locus of causality describes how an individual chose to continue participating in an activity independent of the initial regulatory style. Locus of causality is classified as impersonal, external, or internal according to Self-Determination Theory (Ryan & Deci, 2000).

Impersonal causality

Impersonal locus of causality represents the least self-directed and least motivated level of causation for continuance of an activity. An individual will view the activity as being beyond their ability to control decisions and/or outcomes. An individual who experiences an impersonal locus of causality is likely to react to an activity in a submissive or passive manner (Schunk, Pintrich, & Meece, 2008). The result is an individual reluctant to continue the activity and will often become disengaged from that activity (Deci & Ryan, 1985b).

External causality

An individual can experience external causality if some level of self-directedness occurs during the activity. However, a distinctive difference is the individual feels compelled by an external force to continue participation in the activity. An individual may choose to continue to participate in an activity to gain an external reward, avoid some type of loss, or avoid a pun-
ishment (Schunk, Pintrich, & Meece, 2008). Although the individual has chosen to participate, the individual is less likely to continue the activity in the future because the choice to continue participation was derived from an external pressure (Ryan & Connell, 1989).

**Internal causality**

An individual may choose to continue a task if the task is inherently valuable (Vallerand & Bissonnette, 1992). In other words, the individual’s locus of causality is derived mostly from the interest held for the activity (Ryan & Connell, 1989). Although internal drive is ideal, an individual may not fully realize the internal meaningfulness of an event or activity unless they were first drawn to it through external means. An example would be someone who began an activity for only financial gain, but later found a high level of internal satisfaction from the experience. The individual may continue participation in similar future activities because of high internal meaningfulness and not for financial gain (Schunk, Pintrich, & Meece, 2008).

Self-Determination Theory proposes that human beings are more effectively motivated when allowed to be self-directed as opposed to being externally-directed during a given activity (Deci & Ryan, 1985a). In other words, human behaviors are more effectively initiated and sustained when an individual has an element of decision-making before and during an event or activity. An individual’s behaviors can be motivated by a variety of regulatory styles and perceived locus of causality combinations (Deci & Ryan, 2000). For instance, an individual can potentially begin an activity with an internal directedness, but later develop a more external or impersonal locus of causality towards the activity due to high levels of external directedness. Similarly, an individual could potentially be forced to begin an activity but later develop internal meaningfulness from a level of self-directedness. Figure 1 provides an overview of the taxonomy of human motivation proposed by Self-Determination Theory (Ryan & Deci, 2000).

![Figure 1. Taxonomy of human motivation in self-determination theory. Adapted and reprinted with permission from Ryan and Deci (2000), Academic Press.](image-url)
Methods

We used historical and qualitative interpretative research methods to develop an interpretation of student motivation for SAEs. We were interested in understanding the context and the evolution of SAE motivation through time. The variation of cases and time frames ensured a more detailed depiction of the historical development of SAEs (Rampolla, 2007; Spalding & Parker, 2007). We understood the contextual changes that occurred in agriculture, which affected school-based agricultural education and SAEs: including the changing nature of production agriculture, communities where agricultural education occurred, and the development of the SAE awards system (Boone, Doerfert, & Elliot, 1987; Moore & Borne, 1986; Retallick, 2010; Wilson & Moore, 2007). Thus, we identified primary and secondary sources covering a range of SAE practices and eras in agricultural education. Primary sources included interviews with former agriculture students (Gall, Gall, & Borg, 2007). The interviews were either found in the literature or conducted by us. There were two types of secondary sources utilized in this study.

One type of secondary source was written by agriculture teachers about their students’ SAEs. The student’s motivations were interpreted from how the teacher described the formation and continuance of student’s SAEs; the teachers were assumed to provide credible and accurate depictions of how students became involved and continued their SAE projects. The biases of the teachers were reduced by interpreting the requirements that the teachers set for students while they engaged in SAEs and the student responses that the teacher witnessed. The teacher’s personal opinions were not interpreted.

The second type of secondary sources was written by agricultural education professionals about the SAE practices of agriculture teachers and students. The student’s motivations were interpreted from how the agricultural education professionals described the formation and continuance of student’s SAEs; the agricultural education professionals were assumed to provide credible and accurate depictions of how students became involved and continued their SAE projects.

We examined historical magazines, documents, and books covering school-based agriculture for detailed cases of SAE participation. Three time periods were chosen based on the number of available sources of SAEs information and manuscript space restrictions. Examining cases from three different time periods allowed for historical trends to emerge. We did not interview current students because a contemporary time period analysis would have shifted the focus away from historical methods. We analyzed The Agricultural Education Magazine and 12 texts from 1928-1934; the time frame of 1947-1953 included the The Agricultural Education Magazine, Better Farming Magazine, and 21 texts; and We analyzed the The Agricultural Education Magazine and 9 texts from 1966-1973. While numerous cases emerged from the different time periods, especially during the time periods of 1928-1934 and 1947-1953, the page limitations of this manuscript limited the number of cases that could be described from each time period. Cases were chosen to highlight the variety of different types of SAEs within each time period. We also interviewed former FFA members that had in SAEs during the time frame of 1966-1973. The decision to include interviews was based on the number of cases that emerged from the literature during the time frame of 1966-1973. The third time period had fewer detailed cases of SAEs to analyze compared to the other two time periods. The pool of possible interviewees was collected from a list of six people generated by a state department of education staff. The interviewees were selected based on their level of engagement in FFA and their SAE. We utilized two of the three interviews conducted based on the limited space of the manuscript. First, a female was chosen to represent the unique, but growing population of agriculture students during the early 1970s. Second, a male was chosen who lived on a family farm, worked on the farm for his SAE, but then left the farm after graduating high school. We felt that these students were not recognized in the sources and were part of a growing number of agriculture students during the 1970s.

The data analysis occurred in a collaborative setting and the cases were analyzed for their defining characteristic, regulatory style, and locus.
of control. We categorized the cases by a defining characteristic that best represented the student’s motivation for conducting the SAE. We identified the characteristics to ensure a variety of cases were represented. The defining characteristics were not grounded in agricultural education literature. The characteristics were subjectively chosen by us and peer-reviewed with other agricultural education faculty for accuracy. The characteristics included (class) mandate, student interest/owned, collaboration, experiential learning opportunity, and awards. We then analyzed the cases for their regulatory style and locus of control. The interpretations were grounded in peer-reviewed researched definitions (Ryan & Deci, 2000) and examples provided by a campus professor with expertise in student motivation. Each case was analyzed and compared to the established definitions of regulatory style and locus of causality; cases were labeled with the regulatory style and locus of causality that most accurately represented the characteristics provided in the case. Although the available cases may have had missing information related to the regulatory style and locus of causality, We assumed the available case information to be holistically supportive of making regulatory style and locus of causality characterization interpretation. Each time period had a synopsis of the analysis of cases from that time period.

Trustworthiness and rigor of the research was maintained through research techniques that emphasized creditability, confirmability, and dependability. First, credibility was developed by utilizing consensus and peer-review techniques during the data analysis. An expert in motivational theory was consulted during the consensus process. Primary and secondary historical sources were exposed to external criticism to ensure credibility of the research. Bias was controlled by framing the interpretations in the cases to the case itself and through collaborative debriefing to ensure confirmability. Dependability was built through the inclusion of varying SAE examples and keeping an audit trail. Finally, We developed creditability by finding a variety of SAE cases to ensure a multitude of interpretations (Ary, Jacobs, Razavieh, & Sorensen, 2006; Gall, Gall, & Borg, 2007).

Findings

The findings were divided into three different subsections representing the three time periods included in the analysis. SAE projects were first individually described with a synopsis. Next, each time period case analysis was put into a table format to organize the findings. Then, we developed a description of each individual case.

SAEs from 1928 to 1934

We examined four SAE cases representing the time period from 1928 to 1934. The four defining characteristics of the SAE projects were found to be mandated production project, student interest/student owned project, collaborative project, and awards driven project. Two projects were found to have extrinsic regulatory styles; one project had an amotivational regulatory style, and one project had an intrinsic regulatory style. Three projects were found to have an internal locus of causality while one project had an impersonal locus of causality. The internal locus of causality to continue participation developed through either student-to-student competition or the desire to achieve high levels of accomplishment via FFA awards. The mandated SAE projects were interpreted to have an impersonal effect of student’s locus of causality because students viewed them as a negative component of vocational agriculture. The case descriptions for the time period of 1928-1934 are displayed in Table 1.
Table 1
Interpretive Analysis of SAE Motivators from 1928 to 1934

<table>
<thead>
<tr>
<th>SAE Data and Cases</th>
<th>Defining Characteristic</th>
<th>Categories of Motivation</th>
<th>Regulatory Style</th>
<th>Locus of Causality</th>
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<tbody>
<tr>
<td>Mandated SAEs</td>
<td>Mandated</td>
<td>Regulatory</td>
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</tr>
<tr>
<td>Martin’s poultry SAE</td>
<td>Student Interest/ Student Owned Project</td>
<td>Intrinsic</td>
<td></td>
<td>Internal</td>
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<tr>
<td>Lebanon’s class SAE</td>
<td>Collaborative Projects</td>
<td>Extrinsic</td>
<td></td>
<td>Internal</td>
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<tr>
<td>SAE Awards</td>
<td>Award Driven Project</td>
<td>Extrinsic</td>
<td></td>
<td>Internal</td>
</tr>
</tbody>
</table>

The SAE mandate. The requirement of the Smith-Hughes Act of 1917 for all students to have a SAE was quickly adopted. In 1921-22, 79% of all agriculture students across the nation had a SAE (True, 1929) and this rose to about 90% by 1930 (Maltby, 1931). But, just because most students had a SAE did not mean that all students valued their SAE. Schmidt (1928) illustrated this situation quite well:

In too many instances the project has been regarded as something that must be done because it has been made a requirement. In a school where such an attitude prevails, many of the boys who are studying vocational agriculture regard the projects as a six-month sentence at hard work to be served as a result of selecting the training course in vocational agriculture (p. 260).

Martin’s poultry SAE. As the special editor of the supervised practice section of The Agricultural Education Magazine, G. A. Schmidt reported about SAEs. One such report was a short article about the poultry flock of Martin Rand (1930). As a sophomore Martin wanted to raise a poultry flock of 500 hens on his farm, despite his father’s reluctance. His father initially suggested 50-100 hens, but Martin persisted and eventually his father gave in. Martin built the brooder houses, started a flock, and by the first year made almost $1,000. Martin’s father was so impressed that he encouraged his son to increase the poultry business, invited his other son into a family partnership, and together raised 2,400 baby chicks by year three (Schmidt, 1930).

Lebanon’s class SAE. F. A. Blauer (1930), agriculture teacher of Lebanon, Kansas, conducted a class poultry operation for seventeen students who did not live on a farm. He shared the results of this class SAE in an Agricultural Education Magazine article. The students built the poultry house, cared for the laying hens, and conducted experiments. The results of the production experiments were shared with the community, as well as the products the students’ produced. Blauer reported that students were highly interested in the collaborative project. “A contest spirit prevails among the boys. Such questions as ‘Whose pullets laid the most eggs this week?’, ‘How many eggs today?’, and ‘How are the birds doing?’ are often heard” (p. 54).

SAE awards. The first student awards established for the National Organization FFA were the FFA degrees. The varying levels of degrees were awarded partially based on the students’ SAE. The degree system was designed to recognize students at the local chapter, state association, and national organization level. Nominations for an American farmer degree were privileges that went to the top students in each state (Groseclose, 1929). For instance, James Neal was nominated for the America farmer degree from Oregon in 1931. His biography included:

Neal has been actively identified with the Oregon association and served the organization as its first president. He is a leading character in the Oregon Future Farmer motion picture film made by Southern Pacific Railway during the annual Smith-Hughes Week-end at Oregon Agricultural College, to explain the work of vocational agriculture as carried on in Oregon. James was also the president of his local chapter (Crabtree, 1931, p. 192).
Soon after the establishment of the FFA degree award system, practitioners realized the power of SAE awards to motivate students (Bible, 1941).

**SAEs from 1947 to 1953**

We examined four SAE cases representing the time period from 1947 to 1953. The four defining characteristics of the SAE projects were found to be two required collaborative projects, one mandated placement project, and one student interest/student owned project. The required collaborative projects and mandated placement project were found to have extrinsic regulatory styles while the student interest/student owned project had an intrinsic regulatory style. The two required collaborative projects both had an external locus of causality, but for different reasons; one external locus of causality was derived from money while the other was viewed as a “burden” that must be continued due to its requirement. However, the mandated placement project had an internal locus of causality due to stimulation of the student’s interest. The student interest/student owned case was initially started based on the student’s intrinsic motivation and continued to be derived from an internal locus of causality. The data and case descriptions from 1947-1953 are displayed in Table 2.

**Table 2**

*Interpretive Analysis of SAE Motivators from 1947 to 1953*

<table>
<thead>
<tr>
<th>SAE Data and Cases</th>
<th>Defining Characteristic</th>
<th>Regulatory Style</th>
<th>Locus of Causality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kalispell FFA Chapter’s SAEs</td>
<td>Collaborative Projects</td>
<td>Extrinsic</td>
<td>External</td>
</tr>
<tr>
<td>Joe Harris’s Family Ranch</td>
<td>Student Interest/Student Owned</td>
<td>Intrinsic</td>
<td>Internal</td>
</tr>
<tr>
<td>Battle Ground School Farm</td>
<td>Collaborative Projects</td>
<td>Extrinsic</td>
<td>External</td>
</tr>
<tr>
<td>Urban Placement SAEs</td>
<td>Mandated Placement Project</td>
<td>Extrinsic</td>
<td>Internal</td>
</tr>
</tbody>
</table>

**Kalispell FFA chapter’s SAEs.** The following excerpt comes from G. P. Deyoe’s book, *Farming Programs in Vocational Agriculture* (1953). Deyoe’s research and writings on SAEs were the most extensive in the history of agricultural education. Deyoe included the Kalispell FFA chapter in his section about chapter-wide SAEs: The supervised farming programs of 112 individual boys in a recent year included an average of three improvement projects as well as the ownership projects. The chapter operates a farm of 100 acres on which is demonstrated the restoration of fertility, the reduction of alkalinity, and the control of weeds…. The members are paid dividends on shares which they own in the chapter farm (Deyoe, 1953, p. 218).

**Joe Harris’s family ranch.** The following excerpt also comes from Deyoe’s *Farming Programs in Vocational Agriculture* (1953) text. This text, along with the early edition of the same text (Deyoe, 1947), contained a multitude of detailed examples of SAEs. Deyoe’s presented this example within his section entitled accomplishments of individuals in their farming programs: When Joe [Harris] was in the fourth grade, his father died. Joe, and older brother Sam, and his mother agreed to
keep the 3,800 acre ranch going, and each brother was promised a one-third partnership upon graduation from high school. They developed an extensive cattle enterprise. To aid in hay-making on a large scale, they constructed buck rakes and hay stackers. When Sam was called into the armed forces, Joe became manager of the ranch and the herd of 700 cattle. A major development was the construction of a reservoir for impounding water from a spring; this increased the irrigation potential from 20 acres to 300 acres (Deyoe, 1953, p. 221).

**Battle Ground’s school farm.** B. Brown (1949), the agricultural supervisor from Olympia, Washington, reported on his program’s school farm in *The Agricultural Education Magazine*. Brown described how he managed labor and instruction of the 51 acre school farm:

>The class program is kept flexible so that, if weather permits, a class can go to the farm on short notice. Lockers are provided in which each boy keeps farm work clothes and shoes. Acreage of each crop is rather small so that the labor does not become monotonous. A boy learns to prune raspberries in one or two hours. A week of it would have little or no educational value. Experience driving tractors, plowing, and disking, is possible for all boys in the department (p. 62).

The profits were used to finance the program and students were paid a wage for their work.

**Urban placement SAEs.**

Jamaica Plains and East Weymouth High Schools of Massachusetts, both near Boston, had to adapt to the SAE requirements to fit the placement experiences available to their students. Most of the students did not live on farms (Deyoe, 1947; Nelson, 1950). Over a four year program, students of Jamaica Plains and East Weymouth agricultural programs were expected to spend their summers working with a variety of different local agricultural businesses. Students gained experience in the fields of marketing garden produce, poultry farming, dairy production, and greenhouse operations. This variety of experiences would be hard to duplicate in an individual student’s entrepreneurial production experience, especially in an area near Boston. These types of placement experience arrangements were popular in ever increasingly metropolitan states, such as Massachusetts, because up to 90% of the students did not have the home facilities for an individual production or non-production agricultural experience (Taft, 1960).

**SAEs from 1966 to 1973**

We examined five SAE cases representing the time period from 1966 to 1973. The five defining characteristics of the SAE projects were found to be two mandated projects, one award driven project, one student interest/awards project, and one student interest project. All five projects were found to have extrinsic regulatory styles. Two of the five cases were interpreted to have developed an internal locus of causality originating from personal preference of the project. Three of the five cases were interpreted to have an external locus of causality derived from money, power, requirements, or seeking approval from others. The data and case descriptions from 1966-1973 are displayed in Table 3.
New SAE awards. School-based agricultural education, especially SAEs, changed after the passage of the Vocational Education Act of 1963. Agriculture curriculum had a broader perception of agricultural careers. Students began to have SAEs in broader agricultural careers as well. SAEs were no longer mandated for each student, though individual agriculture programs could still require students to have SAEs. Professionals argued for an update to the SAE award system of the FFA, including proficiency awards, to include more off-farm activities (Kantner & Bender, 1967; Selland & Vog, 1969; Sheppard, 1968). In response to the external pressures the National FFA Organization began to adapt proficiency awards starting in 1970. The changes included the addition of proficiency awards, such as outdoor recreation and forest management, and the inclusion of a placement category to many of the pre-existing proficiency areas (Seefeldt, 1970). These awards would motivate those students in these newer areas by providing them the same level of recognition as students with traditional projects.

Outdoor recreation SAE. The following excerpt was from an interview with a former female FFA member. She was part of a growing minority in agricultural education during that time period. The decision to start the SAE was partially grounded in the likelihood that she could win a proficiency award:

He [the FFA advisor] would do home visits to each student home and interview the family and student to determine the student interest and capability to complete the SAE. We were raising beef cattle and raised tobacco and tomatoes, yet my Advisor knew that I would not be competitive in those areas so we went with the area I was the strongest. My family had sold the dairy farm when I entered high school and bought 70 acres on which we developed a campground. I was able to compete in the outdoor recreation proficiency and won the Southern Region (personal communication, April 11, 2011).

South Rowan High School’s placement SAEs. John W. Allison (1966) was an agriculture teacher that believed in the value of every student having a SAE. He was the agriculture teacher from South Rowan High School in China Grove, NC. The excerpt from The Agricultural Education Magazine was brief, but Allison provided many details about how he managed his students’ SAEs, including facilitating students’ placement experiences:

Out of 113 students enrolled in vo-ag we have 55 engaged in work experiences away from their homes. These work experiences include work on highly spe-
cialized horticulture farms, dairy farms, general farms and produce farms. Our boys realize they are being graded by the farm manager as well as the teacher of agriculture. Systematic raises in pay when earned get a good effort from all students. As students get more experience and exhibit leadership, they are used as field supervisors to direct fellow workers (Allison, 1966, p. 53).

Loudonville’s production SAEs. J. Nowels, of Loudonville, Ohio, was another agriculture teacher that required students to have a SAE, but in this case students had to have entrepreneurial, production projects. Nowels’ (1973) Agricultural Education Magazine article also included his philosophy of a complete program of school-based agriculture:

Students in our vocational agriculture department must carry a minimum of two production projects and three improvement projects per student. In my 25 years of teaching vocational agriculture (21 years here at Loudonville) their requirement has always been met readily by interested students regardless of whether they live on a farm or in town. One hundred per cent of our membership has always exhibited projects at our Ashland County Fair and our local Loudonville Fair. Nearly all of our students have 100 per cent ownership of their production projects (Nowels, 1973, p. 248).

A dairy operation SAE. The following quote is from a former FFA member in the later 1960s. His father was his FFA advisor and he eventually became an agriculture teacher himself. Interestingly, the man talked about his past experience in both the awards he won and life lessons he learned:

I was born into a dairy operation and that was the basis for my SAE. Dad gave me ownership in 2 cows as a freshman in return for milking every morning and afternoons when school or sport activities didn’t interfere. I was also responsible for working the fields raising corn and hay for feed. My dairy operation expanded to 20 cows and replacement heifers through high school and first year of college. I placed 1st in dairy proficiency at the Middle TN regional level. I learned a lot of valuable skills related directly to dairy and crop production. Most importantly, I learned self-discipline and the importance of hard work which helped me get through college and eventually a successful teaching career (personal communication, April 11, 2011).

Conclusions, Implications, and Recommendations

The purpose of this study was to examine student motivation for supervised agricultural experiences (SAEs) through the lens of Self-Determination Theory. From the cases occurring during the 1928-34 era, three of the four cases initiated participation in SAEs by means of externally motivating factors. Three of the four cases in this time period were also sustained by an internal locus of causality. Three of the four cases from 1947-1953 began based on extrinsic motivation of the student. Two of the cases had an external locus of causality while two had an internal locus of causality. All five from 1966-73 began with extrinsic motivation and three of the five cases in this time period being sustained by an external locus of causality.

A conclusion from these findings was that initiating student participation in SAE projects during the selected time periods has been driven by external motivating factors more than internal motivating factors. External motivators appeared in the form of mandating SAE participation, awards, or collaborative SAEs required at school. Internal motivators appeared in the form of student interests and/or student owned projects. These conclusions support the findings of contemporary research on teachers’ facilitation of SAEs. Specifically, Wilson and Moore (2007) found that student participation in SAEs was driven by the teachers’ desire for FFA awards. The FFA award system was also listed as a motivator to implement SAEs by the teachers interviewed in Retallick’s (2010) study. These three conclusions are supported by exist-
ing literature stating external motivators are sometimes necessary to begin an action (Deci, Eghart, Patrick, Leone, 1994; Deci & Ryan, 1985a). Four cases in this study demonstrated SAEs could be started using external motivational strategies, but this motivation can be transitioned into students having an internal drive to continue their SAE. The findings from this study imply that the use of external motivators, though not ideal according to motivational theories, can be a means to initiate student SAE participation (Ryan & Deci, 2000).

We recommend agricultural education practitioners continue to utilize external motivators with caution to introduce students to SAEs. Practitioners should strive to find ways to internally motivate students to participate in SAEs. Reeve (2009) proposed a list of strategies teachers can utilize to enhance students’ intrinsic motivation in learning environments. Educators could better initiate students’ intrinsic motivation for SAEs by applying strategies such as focusing on students’ personal interests related to SAE areas, designing SAEs that would be personally meaningful to the student, or providing rationale to students as to how and why SAEs are important to their educational and/or personal development.

Another conclusion was five SAE cases were started with external motivational approaches and the locus of causality remained external. An internal locus of causality was not evident when SAEs were deemed as only a requirement for the course or continued for money. According to motivational research (Deci & Ryan, 1985a; Ryan & Deci, 2000), the use of external motivating approaches can lead to a lowered chance of gaining an internal locus of causality for the SAE project. Reaching a point of internal locus of causality is ideal according to Self-Determination Theory. The implication from this finding is that externally rewarding students’ continued participation in SAEs, either through program requirements, money, or awards, can condition students for the award more so than the experience. This could subsequently diminish the students’ internal drive for the experience.

It is recommended that agricultural education practitioners use caution when assigning external rewards for student’s participation in learning activities such as SAEs. Overuse of external rewards such as money, trophies, or recognition can potentially reduce a student’s acquisition of the “true” SAE values of enhanced learning and career exploration. Practitioners should strive to help students realize the value of SAEs as a means to learning knowledge and career skills within an agriculture context that can be later transferred to contexts beyond agriculture. Simply put, educators should help students find value in SAEs beyond a plaque and a paycheck.

We acknowledge the limitations of transferability of the findings. The cases included in this study were only interpreted based on what information was provided by the sources. Historical researchers need to continue identifying detailed historical SAE sources to better understand the evolution of SAEs. Future historical research should investigate the motivation of students through historical narrative methods. Historical narrative methods would focus on a couple of students and develop a more detailed historical description of SAEs. This historical analysis found that motivating students to participate in SAEs has been a concern since the 1930s, which echoes the findings of present day SAE research. Navigating the boundaries between using extrinsic rewards and developing an intrinsic drive has been a continual challenge. Considering the decreasing number of agriculture students with a SAE, further research and subsequent instructional approaches are needed to strike a balance between intrinsic and extrinsic motivating strategies to improve the implementation and continuation of valuable SAEs.
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WILLIAM A. BIRD is an Assistant Professor in the Department of Agricultural Leadership, Education and Communication at the University of Nebraska-Lincoln, 303A Ag Hall, Lincoln, NE 68583, wbird2@unl.edu.

MICHAEL J. MARTIN is a Graduate Student in the Department of Agricultural Education at the University of Missouri, 125 Gentry Hall, Columbia, MO 65211, mjmgg7@mail.missouri.edu.

JON C. SIMONSEN is an Assistant Professor in the Department of Agricultural Education at the University of Missouri, 121 Gentry Hall, Columbia, MO 65211, simonsenj@missouri.edu.
The Influence of Collaborative Reflection and Think-Aloud Protocols on Pre-Service Teachers’ Reflection: A Mixed Methods Approach

Cory M. Epler
Nebraska Department of Education
Tiffany A. Drape
Thomas W. Broyles
Rick D. Rudd
Virginia Tech

The purpose of this mixed methods study was to determine if there are differences in pre-service teachers’ depth of reflection when using a written self-reflection form, a written self-reflection form and a think-aloud protocol, and collaborative reflection. Twenty-six pre-service teachers were randomly assigned to fourteen teaching teams. The teams taught a lesson that was videotaped and completed a written self-reflection form while viewing their lesson. The participants were randomly assigned to a control group or experimental group. The control group reflected individually using a written self-reflection form. Experimental Group #1 reflected collaboratively using a written self-reflection form, and Experimental Group #2 reflected individually using a think-aloud process while completing the written self-reflection form. The reflection forms were analyzed for depth of reflection, and a one-way ANOVA revealed significant differences in depth of reflection between the three groups. Participants also engaged in focus group interviews to describe their experiences. Two significant themes emerged: reflection on the teaching experience and reflection on the process used. We recommend that reflection should be used to help pre-service teachers learn from experience. In addition, the use of collaborative reflection and reflection using think-aloud protocols should be considered to promote deeper reflection and understanding.

Keywords: reflection; pre-service teacher reflection; collaborative reflection; think-aloud protocol

Introduction/Conceptual Framework

The challenges associated with preparing teachers for the 21st century are great. In fact, the National Council for Accreditation of Teacher Education (NCATE) recently reported that teacher education programs should be overhauled from subject-matter, theory-laden programs to programs rooted in experience and clinical practice (National Council for Accreditation of Teacher Education, 2010). The council reported that more emphasis should be placed on “giving teacher candidates their sea legs by helping them develop and study their practice,” (NCATE, 2010, p. 3). Furthermore, in the National Research Agenda for the American Association for Agricultural Education, Doerfert (2011) pointed out there is a disconnect between the science of learning and the practice of teaching. He explained that despite the solid research base associated with learning, “a gap exists between the science of meaningful learning and the practice of teaching for meaningful learning” (Doerfert, 2011, p. 22). With this in mind, it is necessary for teacher preparation programs to provide pre-service teachers with meaningful learning opportunities rooted in experience.

One method teacher preparation programs can utilize to help pre-service teachers examine their teaching practices is reflection. Reflection plays a central role in most teacher preparation programs and is a valuable component of professional development (The Association of
Reflection is identified as a method that helps practitioners better understand what they know and do through a consideration of what they learn in practice, and the process places an emphasis on learning from doing (Loughran, 2002). It is widely acknowledged that reflection is prerequisite for in-depth understanding and for furthering professional development (Tigelaar, Dolmans, Meijer, De Grave & Van Der Vleuten, 2008).

John Dewey, a key originator of the concept of reflection, described reflection as a problem solving process. The reflective process begins when a person encounters an experience that involves “(1) a state of doubt, hesitation, perplexity, mental difficulty, in which thinking originates, and (2) an act of searching, hunting, inquiring to find material that will resolve the doubt, settle and dispose of the perplexity,” (Dewey, 1933, p. 12). Dewey’s work supported the notion that reflection is a cognitive process and a special form of problem solving. This process resolves an issue through active chaining, careful ordering, and linking multiple ideas together (Hatton & Smith, 1995). Reflective thinking cannot be compared with simply “thinking things over,” (Rodgers, 2002). Reflective thinking is a rigorous and disciplined way of thinking nested in scientific inquiry and it requires attitudes that value the personal and intellectual growth of the learner through the process. A more contemporary examination of reflection utilizes Schön’s conceptualization that reflection is intimately bound with action (Schön, 1983). Schön emphasized that professionals should learn to frame the problems they are facing, test various hypotheses to solve the problem, and modify actions as a result (Hatton & Smith, 1995; Schön, 1983). Often described as “reflection-on-action,” this requires implementation of solutions that stem from reflecting after an action is completed (Schön, 1983; Yost, Sentner, & Forlenza-Bailey, 2000). The process requires that individuals examine performed tasks in order to review what happened, and it provides an opportunity to examine the relationship and connection of one experience to another (Kim & Lee, 2002; Rodgers, 2002).

Using Dewey and Schön’s notions of reflection as a guide, teacher educators continue to employ strategies that promote the reflection of pre-service teachers. Despite doing so, teacher preparation programs are often scrutinized for not adequately preparing future educators. The process of reflection, when integrated within teacher preparation programs, is a tool that will help prepare future teachers (Lee, 2005). The goal of reflection in teacher preparation is to develop a teachers’ reasoning about why they used a certain instructional strategy and how they can improve their teaching to have a positive effect on students (Lee, 2005). Many teacher education programs claim to be reflective in their practice, but Rodgers (2002) pointed out this is often missing in a thorough exploration of teacher preparation programs. The experiences within teacher preparation programs should broaden the field of experience and knowledge, yet experiences alone are not enough. The addition of reflection to pre-service teachers’ experience allows them to make meaning from experience. This enables pre-service teachers to make sense and draw conclusions from their experiences within a teacher preparation program. Reflection is necessary to help make meaning from experience (Rodgers, 2002). Even though the importance of reflection is documented, Greiman and Bedtke (2008) reported in their study of 31 agricultural education teacher education departments, only one department utilized reflection as an instructional planning component.

Authors of teacher preparation literature described several strategies that help pre-service teachers become more reflective. Those strategies include journaling, peer teaching demonstrations, case studies, and action research projects (Hatton & Smith, 1995; Yost, Sentner, Forlenza-Bailey, 2000). A common strategy utilized in teacher preparation programs is reflective teaching. Reflective teaching promotes growth through analysis and self-directed evaluation (Calderhead, 1987). In many of these teaching experiences, teachers reflect individually using a written self-reflection form to capture their thoughts. In fact, most reflective experiences utilize individual or intrapersonal reflection (Kim & Lee, 2002). In
individual reflection, the learners deliberate and think to themselves about the experience.

While individual reflection is certainly meaningful, in some cases, collaborative reflection can promote deeper reflection. In collaborative reflection, individuals reflect through group discussion and discourse. The experience is not purely an individual process, but it is a process in which learners construct meaning in a situated context (Kim & Lee, 2002). Discussing and comparing experiences with others deepens the learning experience. Collaborative reflection helps teachers refine their teaching skills and approaches to teaching and provides a means for improvement (Martin & Double, 1998). Essentially, working with a partner allows a deeper level of analysis that might be impossible to obtain otherwise. Previous researchers revealed the positive benefits of collaborative reflection and have concluded that collaborative reflection facilitates higher-order thinking when compared to individual reflection (as cited in Kim & Lee, 2002). Hawkey (1995) reported that pre-service teachers expressed a desire to share experiences and knowledge with their peers. They benefitted from the skills and support of their peers. Raywind (1993) concluded that collaborative reflection helps facilitate professional growth and development. By reflecting together, teachers can take their knowledge to the next level through deeper analysis, application, and evaluation (Nicholson & Bond, 2003).

Finally, a think-aloud protocol is a widely used technique that provides information about individuals’ cognitive processes (Sasaki, 2008). In an attempt to better understand how professionals use knowledge to make decisions, researchers commonly used think-aloud protocols (Corcoran, Narayan, & Moreland, 1988). Think-aloud protocols are “retrospective reports,” wherein an individual reports his or her thoughts about a task after it has been completed (Sasaki, 2008, p. 350). When thinking aloud, individuals must maintain focus on the completion of the task and merely verbalize their thoughts (Ericsson & Simon, 1998). This can be challenging because many specific tasks are often automatic (Corcoran, Narayan, & Moreland, 1988). A think-aloud report represents the information held in short-term memory and is considered a direct representation of an individual’s cognitive processes (Corcoran, Narayan, & Moreland, 1988; Sasaki, 2008). These reports allow an individual to search for meaning, theorize, or interpret his or her own behavior and actions. The process promotes deeper reflection as individuals use previously acquired mental representations to plan, evaluate, and reason between alternative solutions (Ericsson & Simon, 1998).

Finally, think-aloud protocols promote the strategic processing of information; therefore the process may lead to a deeper understanding of the cognitive and metacognitive processes one uses. Because learning to teach involves complex interactions between cognitive and metacognitive processes, the think-aloud process facilitates reflection as a valuable learning experience for teachers (Calderhead, 1987). Even so, there remains a lack of research to examine think-aloud protocols and their influence on teacher reflection. For example, the majority of research associated with think-aloud protocols is used to gain insight into individuals’ reading processes in an attempt to help identify the differences between less able and more able readers (Berne, 2004). With this in mind, incorporating think-aloud protocols in reflective experiences should create a deeper and more meaningful learning experience.

**Purpose and Objectives**

Because reflection creates meaningful learning experiences within teacher preparation programs, the reflective experiences of pre-service teachers should be examined. Furthermore, teacher educators should create reflective experiences that maximize learning through reflection. Drawing upon Dewey’s conceptualization of reflection and Schön’s notion of reflection-on-action, several questions emerge related to the reflective experience of pre-service teachers. How can teacher educators create meaningful reflective experiences for pre-service teachers? Are the reflective experiences of pre-service teachers designed to maximize depth of thinking and promote advanced critical thinking skills? As collaboration and the use of think-aloud protocols promote greater cognitive
and metacognitive processing, will reflective experiences utilizing collaboration and think-aloud protocols lead to deeper reflection? The specific research questions that guided this study include:

1. What are the differences in depth of reflection for pre-service teachers when using individual reflection, individual reflection using a think-aloud protocol, and collaborative reflection?

2. How do pre-service teachers describe their experience when reflecting individually, collaboratively, and using a think-aloud protocol?

**Methodology**

To address the above research questions, we selected a convergent parallel mixed methods research approach (Creswell & Plano-Clark, 2011). The purpose of a convergent parallel design is to “obtain different but complementary data on the same topic” (Creswell & Plano-Clark, 2011, p. 77). This particular design is useful when the researcher wants to triangulate the methods by comparing and contrasting quantitative statistical results and qualitative findings. In the convergent parallel design, quantitative and qualitative data are collected and analyzed separately. The merging of the two sets of data typically occurs as discussion or as part of the conclusions based on data analysis (Creswell & Plano-Clark, 2011). The method is also particularly useful when the data are transformed from one type into the other type of data (i.e. transforming qualitative themes into quantitative counts).

The convenience sample included pre-service teachers enrolled in the Career and Technical Education teacher preparation program at a large university in the mid-Atlantic region. This teacher preparation program meets the requirements set forth by the state department of education and upon completion of the program, participants will have earned a Master’s Degree in Career and Technical Education (CTE), with a specialization in Agricultural Education, Business and Information Technology, Marketing, or Family and Consumer Sciences. All participants hold a Bachelor’s degree within their discipline specific to their intended certificate. There were twenty-six participants. Twelve participants were pursuing Agricultural Education certification, ten were pursuing Business and Information Technology/Marketing Education, and four participants were completing a concentration in Family and Consumer Science Education. Seventy-three percent of the participants were female (19 participants).

Upon receiving university Institutional Review Board approval and obtaining written consent from the participants, teaching teams (two participants per group) were randomly assigned to teach the same pre-written lesson. The teaching teams taught their lessons to their peers in a teaching demonstration which was videorecorded. Following the peer teaching demonstration, the participants participated in a reflective experience where they completed a written self-reflection form while viewing their videorecorded lesson. The written self-reflection form asked participants to reflect on three domains using three reflection prompts. The reflection prompts included: (1) What were my particular strengths in this area?, (2) What would I change in regards to this particular area?, and (3) How could I go about making that change?

The first domain asked the participants to analyze their ability to communicate with students. This domain included three sub-domains: (1) directions and procedures, (2) explanation of content, and (3) expectations for learning (Danielson, 2007). The second domain focused on the discussion techniques the participants used while teaching. This domain included three sub-domains: (1) quality of questions, (2) discussion techniques, and (3) student participation (Danielson, 2007). The final domain included an analysis of the ability of the pre-service teachers to demonstrate flexibility during their lesson. This domain included three sub-domains: (1) lesson adjustment, (2) response to students, and (3) persistence (Danielson, 2007).

Six participants were randomly assigned to the control group. The remaining participants were randomly assigned to two experimental groups. Experimental Group #1 included 14 participants (seven teaching teams), and Experimental Group #2 included six parti-
Participants. Experimental Group #1 participated in a collaborative reflective experience in which a written self-reflection form was utilized. The seven teaching teams watched their videotaped lesson and completed their written self-reflection form as a pair, and they were encouraged to discuss the experience while completing the written self-reflection form. Experimental Group #2 completed an individual reflective experience using written self-reflection form and a think-aloud protocol. In this group, the six participants were asked to verbalize their thoughts before completing the written self-reflection form. The control group included six participants who completed an individual reflective experience using only the written reflection form. The control group completed their written self-reflection form as they watched their videotaped lesson. To ensure consistency of the reflective experience and minimize distractions, the experimental groups and the control group watched their videotaped lesson in an assigned classroom on campus.

After the experimental groups and the control group completed the reflective experience, we analyzed the reflection forms using a researcher-developed categorization scheme that was created from previous research that analyzed depth of reflection (Facione, 1990; Kember et al., 1999; Lee, 2005; Mezirow, 1990; Wong, Kember, Chung, & Yan, 1995; Yost, Sentner, & Forlenza-Bailey, 2000). Each subdomain of the reflection forms were analyzed independently for the control group and experimental groups. Scores were assigned ranging from one to three and half scores were assigned if responses included characteristics of two levels. Each researcher categorized the self-reflection forms for all groups using a categorization scheme synthesized from the literature. The categorization scheme allowed us to classify the depth of reflection based upon three levels identified through previous research: (1) recall level: R1, (2) rationalization level: R2, and (3) reflectivity level: R3 (Lee, 2005). Data were recorded in the written form by each researcher and converted to an Excel file. The data were analyzed using JMP 8.0 for Windows™ statistical package. We established a priori a minimum significance level of 0.05. According to Coolidge (2006), this is the conventional minimum level of significance. The researcher developed categorization scheme and a description of each level follows.

**Recall Level (R1)**

This level describes the characteristics of “non-reflectors” who indicate a simple awareness of the experience (Lee, 2005; Mezirow, 1991; Wong et al., 1995). Participants identified as non-reflectors described what happened during the teaching experience, rather than providing a rationale for why the happenings occurred. In addition, the participants classified as R1 described their attempts at modeling teaching methods they observed or were taught, yet they focus on only recalling the experience of using those methods. At this level, the participants referred to their thoughts and feelings, but did not describe how or why those feelings were developed (Kember et al., 1999).

**Rationalization Level (R2)**

This level describes characteristics of “reflectors” who possess the ability to critique perception, thinking, and judgment while extracting meaning from an experience (Facione, 1990; Lee, 2005; Mezirow, 1991; Wong et al., 1995). In this experience, participants identified as reflectors interpreted their teaching experience with a rationale for why happenings might have occurred. In addition, the participants examined the intended and actual relationships between pieces of their experiences and described their search for why happenings occurred. Reflectors were able to generalize their experiences and create guiding principles for future lessons. At this level, the participants referenced their thoughts and feelings, described how and why their feelings were developed, and assessed the logical strength of their feelings (Facione, 1990; Kember et al., 1999).

**Reflectivity Level (R3)**

Participants classified within the R3 level – “critical reflectors” – approached the experience with the intention of changing/improving their
teaching in the future (Lee, 2005; Mezirow, 1991; Wong et al., 1995). As a result of the reflective experience, the critical reflectors were able to form strong hypotheses based upon the evidence at hand (Facione, 1990). Additionally, the participants provided justification for multiple perspectives as they examined the issues they faced while teaching. Critical reflectors appear amendable to change, and they described how their teaching might influence their students’ behaviors and actions. Furthermore, critical reflectors framed their decisions within the broader ethical, moral, political, and historical decisions behind their actions (Yost, Sentner, Forlenza-Bailey, 2000).

Following the reflective experiences, focus groups were conducted. The focus groups allowed the participants to have time to reflect and recall experiences in a group setting where one response can trigger additional feedback from the rest of the group (Lofland, Snow, Anderson, & Lofland, 2006). We conducted three separate semi-structured focus group interviews, and each focus group interview had one facilitator. Homogeneous groups were selected by us to ensure participants within each focus group experienced either the control or treatment groups. The focus groups lasted 30 minutes. Data analysis for the focus group interviews began during the interviews with probing and follow-up questioning. All interviews were audio recorded and transcribed verbatim by us. Researchers employed the comparative analysis method to analyze the data (Corbin & Strauss, 2008).

### Findings

The reflection forms were analyzed using a researcher developed categorization scheme based upon previous researchers’ efforts to analyze depth of reflection. A one-way between subjects ANOVA compared the effect on type of reflective experience on the raters’ overall mean scores. There was a significant difference on the type of reflective experience according to the raters’ overall mean score at the p<.05 level for the three experiences \[ F(2, 16) = 6.81, p = 0.007 \]. Post-hoc comparisons using the Tukey-Kramer HSD test indicated that the raters’ overall mean score for the control group (written reflection only) \( M = 1.65, SD = 0.31 \) was significantly different than Experimental Group #1 (collaborative reflection) \( M = 1.22, SD = 0.16 \). An effect size of 1.73 indicates a non-overlap of 75.4% in the two distributions (Cohen, 1988). Experimental Group #2 (think aloud) \( M = 1.47, SD = 0.10 \) did not significantly differ from the collaborative and individual reflection groups. Table 1 provides the total mean score for the control group and experimental groups.

<table>
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<tr>
<th>Total Mean Scores of Control Group and Experimental Groups</th>
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<td>------</td>
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<tr>
<td>Control</td>
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<tr>
<td>Experimental Group #1</td>
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<td>Experimental Group #2</td>
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*Note. Control group completed an individual reflective experience using only the written reflection form. Experimental Group #1 participated in a collaborative reflective experience in which a written self-reflection form was utilized. Experimental Group #2 completed an individual reflective experience using written self-reflection form and a think-aloud protocol. Possible score range is 1-3. *p < .05.*
Table 2
Mean Scores of Constructs for Control Group and Experimental Groups

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<thead>
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<th>Communicating With Students</th>
<th>Discussion Techniques</th>
<th>Flexibility During Teaching</th>
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<tbody>
<tr>
<td>Control (n = 6)</td>
<td>M (SD)</td>
<td>d</td>
<td>M (SD)</td>
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<tr>
<td>Experimental Group #1 (n = 14)</td>
<td>1.17* (.10)</td>
<td></td>
<td>1.31 (.12)</td>
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<tr>
<td>Experimental Group #2 (N = 6)</td>
<td>1.47 (.11)</td>
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<td>1.52 (.13)</td>
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*Note. Control group completed an individual reflective experience using only the written reflection form. Experimental Group #1 participated in a collaborative reflective experience in which a written self-reflection form was utilized. Experimental Group #2 completed an individual reflective experience using written self-reflection form and a think-aloud protocol. Possible score range is 1-3. *p < .05.

As depicted in Table 2, a one-way between subjects ANOVA was conducted to compare the effect on type of reflective experience on the raters’ domain mean scores. There was a significant difference in the type of reflective experience on raters’ domain mean score of communicating with students at the p<.05 level for the three experiences [F(2, 16) = 6.36, p = 0.009]. Post-hoc comparisons using the Tukey-Kramer HSD test indicated that the raters’ domain mean score for control group (written reflection only) (M = 1.70, SD = 0.11) was significantly different than Experimental group #1 (collaborative reflection) (M = 1.17, SD = 0.10). In addition, there was a significant difference in the impact of the type of reflective experience on raters’ domain mean score of flexibility during teaching at the p<.05 level for the three experiences [F(2, 16) = 4.88, p = 0.02]. Post hoc comparisons using the Tukey-Kramer HSD test indicated that the raters’ domain mean score for control group (written reflection only) (M = 1.53, SD = 0.09) was significantly different than experimental group #1 (collaborative reflection) (M = 1.15, SD = 0.08).

Finally, based on three focus groups, two major themes emerged from the analysis of the qualitative data. These categories are used as a framework for organizing the discussion. The themes will be discussed separately. However, they are not experienced independently of one another but holistically. The two major themes were reflection on the teaching experience and reflection on the process used. Content related to the identified themes are described next with direct quotations.

Reflection on the Teaching Experience

Participants in the control group and both experimental groups described in detail their reflection on their teaching experience. Participants pointed out the value in reflecting on their peer teaching demonstration. “It helped me to see things that I did or didn’t…did or didn’t flow well” [9]. Another participant agreed that reflection provided an opportunity to examine the overall effectiveness of the lesson. “…it just allowed us to see how things – what aspects went well and what didn’t go well…” [18:19]. The reflective experience helped the participants recall their teaching, and it helped them to validate the changes they felt they needed to make in future teaching. “After we taught, my partner and I had already seen what we really needed to change and started doing that. Then we watched the video – it reiterated and made me more confident about the changes we needed to make” [341:343]. Another participant expressed similar feelings. “I kind of noticed things that I hadn’t even thought that I wasn’t doing right. It showed me that I was doing things that I thought I was doing right the whole time” [440:442]. “…[the reflective experience] gives you a list of things you were working on…you could be consciously thinking ‘Okay, I’m trying to do this. I’m trying to do this’”
Additionally, as a result of the reflective experience, participants indicated they would change how they taught this particular lesson. “...it allowed us to see how we could alleviate those problems when we taught again” [20]. Participants also described specific changes they would make in their lesson as a result of the reflective experience. “We took out one of the activities because we realized two of them were very similar and the students didn’t really understand the difference between the two during the practice teach. We just combined them into one” [44:46]. Another participant also described a potential change to their lesson plan. “...we had it broken up where one person did one activity and the next person did another activity. We found when that happened the other person was just standing in front of the room, so we modified it” [53:55].

Reflection on the Process Used

While the participants described the benefits of the reflective experience, there were notable differences in the experiences of the control group and the experimental groups. Specifically, control group participants described the benefits of completing only the written self-reflection form. “It just helped me to think about things in a way that I hadn’t” stated one participant [82]. Another participant corroborated his or her colleague’s feelings. “I think writing in general kind of makes you have to come full circle with your thoughts, so I think it just makes it more complete” [85:86]. Additionally, the written self-reflection process was described as beneficial. The form itself provided “structure,” and it gave the experience “organization.”

The use of a think-aloud process provided both benefits and challenges for the participants in Experimental Group #2. “I thought it was awkward at first,” stated a participant [146]. Others in the think-aloud group described this same sentiment. “Well, I thought it was awkward, and I was a little self-conscious,” one participant described [135]. They explained: “It was weird sitting there talking to the computer screen. You didn’t want someone to talk by...they might say ‘What’s she doing in there? Who is she talking to? Wait a minute. That’s just her in there taking to herself’” [240:243].

Even though participants expressed several challenges associated with thinking-aloud, they were able to express how the process helped them reflect. “…I didn’t mind it at all. It was actually kind of neat because there were no distractions. I could think about exactly I wanted to say and say it” [146:148]. Another participant described how the think-aloud process helped her elaborate upon her thinking. “It’s easy to elaborate upon yourself when you’re talking aloud rather than just writing it down...if you’re talking, you kinda come up with everything as you’re speaking. You keep diverging into it – keep coming up with newer ideas” [187:190]. The think-aloud process helped the participants process the peer teaching demonstration and helped them identify ways to change or improve their teaching. “…having to talk to yourself about it, just made you think or look back on what you did and what you could do better. It was kinda cool”[177:178]. Another participant anticipated the differences between using only a written self-reflection form and using a think-aloud process. “When you’re talking...it gives you more flow rather than just writing it down, which is what we normally do when we do reflection. Talking aloud and hearing yourself say something is different” [408:410].

The collaborative reflection experience participants (Experimental Group #1) also described the advantages of working with partner to reflect. Reflecting with a partner provided an opportunity for the participants to brainstorm how they could improve their teaching. “Me and my partner discussed all the things that we saw and all the things we can improve and change” [423:424]. Another participant described the same result of reflecting with a partner. “…we were able to, I guess, talk about it and come up with new ideas at the same time. I guess two heads are always better than one in coming up with new, creative ideas how to fix things” [584:586]. Additionally, the collaborative reflective experience provided an opportunity to gain another perspective on how the peer teaching demonstration went. “We could get both perspectives. ‘To me, it looks like I did bad. What do you think?’” [572:573]. By reflecting with a partner, the pre-service teachers indicated the reflection process was “easier,”
and it created more opportunities to figure out “…what we were going to fix for the next time” [546]. Although the collaborative reflective experience had notable benefits, it presented some challenges for the participants. The process was described as “distracting” and some felt it was difficult to focus during the experience. “It was kind of distracting to work with someone else because at the same time, we were laughing at ourselves. So that was kind of distracting…” [591:592].

Conclusions

The objective of this study was to determine the differences in depth of reflection for pre-service teachers when using individual reflection, individual reflection using a think-aloud protocol, and collaborative reflection. The conclusions of this study are not generalizable beyond the population in this particular study. We made the following conclusions based on the data collected. The findings support the idea that reflection is a valuable experience for pre-service teachers. As a result of reflecting upon their teaching, participants in both the control and experimental groups identified changes they would make to the lesson plan and their teaching methods. “I definitely reflected on what I could have done better,” said one participant. “[I] really thought about the different things I did, and what I didn’t do” [64:65]. In fact, one pre-service teacher went as far to say that that reflection, “improved my teaching” [423]. Furthermore, the reflection process itself provided the pre-service teachers with structure and organization, which promoted deeper reflection. “Because [the reflection forms] had different sections, it made you reflect on the whole. It made me think about things that I could do differently,” described one participant [74:75]. Another pre-service teacher elaborated on how the structure of the process helped him/her reflect. “It gave me more ideas to reflect upon. I probably wouldn’t have thought of some of those questions or reflected on certain aspects of the lesson. The form helped me think about things that I probably would have [without them]” [93:94]. It can be concluded that reflection facilitated a consideration of change in teaching practices for the pre-service teachers in both the control and experimental groups.

The analysis of the written self-reflection forms revealed that the participants’ depth of reflection ranged from recall (R1) to the rationalization level (R2). The R1 level describes characteristics of “non-reflectors,” while the R2 level describes characteristics of “reflectors.” The mean scores for the written self-reflection forms ranged from 1.22 to 1.65. This indicates that the participants in this study merely described a simple awareness of what happened during their teaching. The participants referred to their thoughts and feelings, but they did not describe how or why those feelings developed. This was confirmed through the data generated from the focus group interviews. One participant described their awareness of their teaching. “I noticed that I’m not a very good describer of activities” [24]. Another pre-service teacher described a similar depth of reflection. “We had to change one of the games because we saw that it didn’t work at all. So we completely made a new system for selecting groups” [492:493]. However, some participants indicated depth of reflection in their written self-reflection forms. While thinking about why things happened, some pre-service teachers were also actively looking at the relationships between the “why” and creating guiding principles for future lessons. This is a characteristic of R2 reflection. This depth of reflection was illustrated by the data. “So after [teaching the lesson] – this was almost a week later that we saw it, I’d already been working on my lesson, thinking to myself ‘Well, I’m not gonna ask these questions anymore. I’m gonna do this – gonna ask these questions’” [333:334].

There was not a significant statistical difference between the mean scores of the written self-reflection forms of Experimental Group #1 (collaborative reflection) and Experimental Group #2 (reflection using think-aloud protocol). In fact, previous researchers have indicated that both methods promote deep processing (Corcoran, Narayan, & Moreland, 1988; Ericsson & Simon, 1998; Kim & Lee, 2002; Martin & Double, 1998; Nicholson & Bond, 2003; Sasaki, 2008). The qualitative data supported the conclusion that both methods enhanced the pre-service teachers’ reflective
experience. For example, one participant described the benefit of using a think-aloud process. “It was a way to be really honest when you critiqued your teaching. You didn’t have to say what somebody else wanted to hear. It was really way to be honest and really reflect” [184:185]. In addition, another participant discussed the benefit of reflecting collaboratively. “We could discuss what would be best for us. It was easier to collaborate and change the lesson since we did it together” [556].

The mean scores for the control group’s written self-reflection forms (M = 1.65) were higher than the collaborative group (M = 1.22) and think-aloud group (M = 1.47), thus indicating the control group had the greatest depth of reflection. With this in mind, it was also noted that the participants in both experimental groups described collaborative reflection and reflection using a think-aloud as distracting and awkward. For example, one participant recounted being uncomfortable using a think-aloud process. “It occurred to me that people could be walking by, seeing me talking to myself. I felt that as inhibiting” [136]. Another participant described the distracting nature of the think-aloud process. “I kinda forgot at times to say what I was thinking. I had to go back and catch up on what I was thinking” [154]. One pre-service teacher that reflected collaboratively also indicated being distracted. “[My partner and I] were like ‘Oh my gosh! I can’t believe we sound that way! That’s what we look like? That was distracting’” [593:594]. As a result, We concluded that the distractions and awkwardness of collaborative reflection and the think-aloud process played a role in the level at which participants reflected. This was supported by the qualitative data as participants described the distracting nature of the collaborative reflection process and the awkwardness experienced during the think-aloud process.

Recommendations

Pre-service teachers should be provided with opportunities to reflect on their teaching throughout their teacher preparation program. This will help them identify ways they can improve their teaching in order to help students succeed. In this particular study, the pre-service teachers articulated how the reflective experience helped them improve their teaching. Furthermore, the participants expressed that the reflective experience will influence how they approach teaching in the future. “After we teach a class, we can go back in our lesson plans and write notes of things that we could change, things we liked, or things that went really well. Reflecting like that would be beneficial,” said one participant [516:518]. With that in mind, teacher educators should continue to embed reflective experiences into teacher preparation programs.

Working collaboratively and using a think-aloud process has been identified as a method that promotes greater cognitive and metacognitive processing (Corcoran, Narayan, & Moreland, 1988; Ericsson & Simon, 1998; Kim & Lee, 2002; Sasaki, 2008). With this in mind, pre-service teachers should be encouraged to utilize these methods when reflecting. However, as illustrated in this study, working collaboratively and using a think-aloud process can be distracting. Therefore, teacher educators should provide training for how to use both methods. The think-aloud process should be modeled, and pre-service teachers should be given the opportunity to practice the method before beginning the reflective experience. In addition, to fully understand the impact think-aloud protocols have on reflection, the think-aloud verbalizations can be recorded and transcribed. Analysis of the transcripts would help researchers understand which information the participants attended to, how they processed the information, and the manner in which they combined information to make decisions. Finally, in order to ensure the accuracy of the written self-reflection forms to what is actually experienced during collaborative reflection, the collaborative reflection experience should also be recorded and transcribed. This would help researchers determine if there was a discrepancy between what was verbalized and what was written on the reflection form. By doing so, the researcher would be able to determine if the depth of reflection (as indicated by the written self-reflection form) was influenced by working with a peer.
While this particular study was completed with pre-service teachers, we suggest future studies designed to examine the differences between pre-service and in-service teachers reflective experiences. Which would lead to greater depth of reflection for in-service teachers — individual reflection, individual reflection using a think-aloud protocol, or collaborative reflection? This particular line of inquiry could help maximize the reflective experiences of in-service teachers and continue to promote the idea of a reflective practitioner within classrooms.

References


**CORY M. EPLER** is the Deputy Director for Nebraska Career Education within the Nebraska Department of Education, 301 Centennial Mall South, Lincoln, NE, 68509, cory.epler@nebraska.gov.

**TIFFANY A. DRAPE** is a Project Associate within the Office of Educational Research and Outreach at Virginia Tech, 217 East Eggleston, Blacksburg, VA, 24061, tdrape@vt.edu.

**THOMAS W. BROYLES** is an Assistant Professor in the Department of Agricultural and Extension Education at Virginia Tech, 268 Litton-Reeves Hall, Blacksburg, VA, 24061, tbroyles@vt.edu.

**RICK D. RUDD** is a Professor in the Department of Agricultural and Extension Education at Virginia Tech, 2270 Litton-Reeves Hall, Blacksburg, VA, 24061, rrudd@vt.edu.
The History of Future Farmer Organizations Around the World

James J. Connors  
University of Idaho

The establishment of the Future Farmers of America in 1928 and its subsequent growth in size and scope was noticed around the world. Agricultural education professionals from dozens of other countries wanted to know about the organization and how it helped motivate young rural boys to study vocational agriculture and choose agriculture as a career field. Over the course of several decades, many countries started their own “future farmer” organizations. The most successful was the Future Farmers of Japan, which is a large and vibrant organization to this day. As the FFA grew, so did its involvement in international activities. The FFA has worked with many other countries to offer exchange programs, study tours, and travel seminars for state FFA officers, award winners, and national FFA officer teams. The FFA has also offered Work Experience Abroad, World Experience in Agriculture, and the World AgriScience Studies Programs. This historical research study investigated future farmers’ organizations in other countries, the history of FFA international activities, and study tours and travel seminars for award winners and FFA officers.

Keywords: Future Farmers of America, International, History

The Future Farmers of America organization has been involved in international activities since it was established in 1928 (Tenney, 1977). Even before the FFA was founded, American agricultural education professionals were traveling to remote corners of the world to offer advice and recommendations on agricultural education and youth development to other countries (Allen, 1939; Dickinson, 1947). As the Future Farmers of America grew in size and scope, agricultural educators from around the world took notice of the impact the organization was having with rural agricultural youth in the United States.

Government officials, agricultural educators, and international development organizations began contacting the Future Farmers of America to find out details about FFA programs, activities, and events. So many countries were contacting the FFA that the organization developed a brochure titled “The Future Farmers of America: What it is, What it does” (Future Farmers of America, n.d.) that was printed in English, Spanish, Portuguese, and German. Educators around the world were realizing how future farmers’ clubs could be used to organize and motivate youth to study agricultural education and enter the field of agriculture.

Over the period of several decades, numerous other countries established “Future Farmer” organizations for their youth. In many countries the name “Future Farmers of...” was used. In other countries, different names were used for youth agricultural education clubs. Regardless of the final name chosen, similar symbols, rituals, skill development events, and leadership development activities were included in these organizations. This study investigated the Future Farmers of America’s long history in international agricultural education activities, including the establishment of Future Farmers’ clubs in other countries around the world.

Theoretical Framework

Agricultural education professionals from the United States have been working in other countries for decades. Sherman Dickinson was the Chief of Party in the Brazil Cooperative Agricultural Program in the late 1940s. Writing in The Agricultural Education Magazine, Dickinson (1947) stated,
Our program in agricultural education is attempting to cooperate with the Brazilian Ministry of Agriculture in developing plans whereby the agricultural situation may be improved. It has been agreed that this may be best accomplished by means of increased educational opportunities for rural peoples, emphasizing training in practical agriculture (p. 237).

The Future Farmers of America wasn’t the only organization of interest for other countries. The 4-H youth clubs were also involved internationally since their development in the early 1900s. Smith and Kirkpatrick (1990) reported that “Long before the International Farm Youth Exchange (IFYE) program was initiated in 1948, the 4-H movement in America had won the interest and respect of several foreign nations” (p. 150). The authors also reported that, “As early as the 1920s and 1930s, Canada, England and a few other countries set out to develop similar youth groups” (p. 150). Over the next decades, 4-H clubs were established around the world. Smith and Kirkpatrick wrote that,

By the late 1940s, South Korea had established a 4-H type program with some 3,729 clubs and 142,500 members. And in 1949, Austria launched a program similar to 4-H as part of the Marshall Plan. By 1953, 23 countries in Asia, Europe and Latin America had 4-H type clubs. (p. 150).

Reck (1951) described the beginning of 4-H clubs in Denmark by stating, “Denmark had been working with rural young people since 1913, when agricultural societies organized farm boys into groups to receive technical instruction” (p. 221). Denmark made arrangements to host a USDA extension specialist to assist in establishing 4-H clubs. Meetings were held throughout 1923-24 and “club work actively started in the spring of 1924” (p. 221). Reck (1951) reported that, “They adopted the four-leaf clover and the four *H*s, the letters in this case standing for *Hoved*, *Hjerte*, *Haand*, and *Helbred*, the Danish words for head, heart, hand and health” (p. 221).

The issue of educating rural youth in developing countries is one that is not new in international development. Finley and Price (1994) wrote that “rural young people is another group that had received too little attention in agricultural extension programs. Millions of young people living in rural areas are a significant and untapped resource” (p. 238). The authors went on to write that, “Rural youth has a widespread need for practical training in agriculture...special efforts are needed in agricultural education, extension education, and training to include a higher proportion of rural young women” (p. 238).

When the Soviet Union occupied the Baltic State of Lithuania in 1940, they closed the long established Lithuanian Chamber of Agriculture and its affiliate Lithuanian Young Farmers Circles Union. The Lithuanian Chamber of Agriculture was originally founded in 1926 (Lithuanian Chamber of Agriculture, n.d.). The mission of the LCA is to be the main supporter of the viability of rural society and raise a strong, motivated and independent person, able to develop a competitive agriculture and to maintain safe and attractive living environment. According to Edwards, Thuemmel, and Kisieliene (2000), “In February 1989...a conference of young farmers was held at which time it was decided to ‘restore’ Young Farmers’ Circles in Lithuania” (p. 18).

Throughout the late 1980s and early 1990s, there was a strong emphasis on incorporating international agriculture concepts into secondary agricultural education curricula in the United States. In 1989, Martin wrote about the global perspective for agricultural education. He suggested that agriculture students should get involved in the Work Experience Abroad program, teachers should be involved in travel/work experience overseas, and that agriculture teachers should develop an exchange system with a school in another country.

In another article, Martin (1993) wrote a rationale for internationalizing agricultural education. His selected activities to internationalize agricultural education programs included a recommendation that FFA should “help establish/enhance youth organizations in other countries” (p. 21). He also suggested that the FFA develop youth leadership camps in other countries around the world. Martin concluded by stating, “There is a tremendous
international frontier waiting for development of programs modeled after agricultural education/FFA as we know it in the U.S.A.” (p. 22).

Writing about the need for rural youth development around the world, Lindley (1989) stated, “Youth activities and competitions at the national, regional, and international level are almost non-existent in the developing countries. Support and promotion of international youth exchanges among developing countries would provide opportunities for leadership development for rural youth” (p. 13).

Lindley gave several examples of youth components in rural development programs including:

The organization and guidance of rural youth for leadership development, skill training, service and production purposes. This includes the formation of youth clubs such as 4-H in the USA, Tani Tasuna (future farmers’ groups) in Indonesia, Anak Bukid (farm youth clubs) in the Philippines, rural youth clubs in South Korea, 4-S in Swaziland, 4-K in Kenya through the agricultural extension services.” (p. 14)

Agricultural education professionals in the United States, have been involved in international activities for almost a century. They have worked in distant countries to develop their agricultural education systems. They have worked to infuse leadership development activities for rural youth in poor, developing countries, and they have worked to incorporate international agricultural concepts into domestic agricultural education curricula. The establishment of future farmers’ clubs in other countries is just one way that American agricultural education has worked to improve agricultural education and youth leadership development around the world.

Purpose and Objectives

The purpose of this historical research study was to document the history of future farmers’ organizations around the world. Specific objectives which directed the study included:

1. Document the interest in, and establishment of, future farmers’ youth organizations in other countries.
2. Describe the history of international activities within the National FFA Organization.
3. Describe the history of the international travel seminars for National FFA Officers, state FFA officers, and national award winners.

Methods

This study was a historical research investigation. McDowell (2002) stated that, “Historians examine the past so that we may have a better understanding of the content of past events and the context in which they took place” (p. 4). I utilized historical research methods to address the purpose and objectives of the study. Borg and Gall (1983) wrote that, “Historical research involves the systematic search for documents and other sources that contain facts relating to the historian’s questions about the past” (p. 800). Research was conducted at the National FFA Archives at Indiana University ~ Purdue University, Indianapolis, at land-grant university libraries, and departments of agricultural education libraries. Whenever possible, primary sources were utilized. Primary sources included magazine articles, journal articles, meeting notes, and personal communications in the form of original source letters available at the National FFA Archives. Secondary sources of information included books, convention proceedings, and periodical articles (Ary, Jacobs, Razavieh, & Sorensen, 2006).

In every case, I exposed the historical documents to external and internal criticism to determine their value in addressing the objectives of the study. I examined each document thoroughly to ascertain if it was authentic and authored by the individual whose name appeared on the document. I then examined the content of the document to establish internal criticism. I evaluated the document to determine the worth of the evidence and whether it provided a true report of the historical event. I also attempted to triangulate information from several sources, both personal
notes, minutes, and secondary reports of activities.

One limitation of this study was my inability to determine the current status of future farmers’ youth organizations in other countries. This objective, which would provide valuable information, was unfortunately outside the scope of this study.

Results

Shortly after the FFA was organized, agricultural educators, FFA advisors, and members began traveling the world to promote youth development through Future Farmers’ clubs. In a summary report on International Programs (Tenney, 1977), it was written that, some pioneering work was done in many countries, including Albania, Greece, Egypt, India, Korea, Thailand, Taiwan, Japan, Philippines, South Viet Nam, Honduras, Canada, South Australia, Peru, Columbia, Brazil, and Mexico. (p. 119)

The National FFA Archives contains hundreds of letters from government officials, educational professionals, and community organizations from around the world requesting information about the FFA. The following is a sample of some of the countries from which letters were received:

<table>
<thead>
<tr>
<th>Bavaria (Germany)</th>
<th>France</th>
<th>Malaya</th>
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</thead>
<tbody>
<tr>
<td>Brazil</td>
<td>Germany</td>
<td>Morocco</td>
</tr>
<tr>
<td>Ceylon (Sri Lanka)</td>
<td>India</td>
<td>Philippines</td>
</tr>
<tr>
<td>Cyprus</td>
<td>Ireland</td>
<td>Sweden</td>
</tr>
<tr>
<td>Denmark</td>
<td>Israel</td>
<td>Trinidad-Tobago</td>
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<tr>
<td></td>
<td></td>
<td>Uruguay</td>
</tr>
</tbody>
</table>

Figure 1. Countries from which request letters were received

Future Farmers of Greece

In 1935, Adams reported that the Future Farmers of Greece was currently being organized in the Mediterranean country. The American Near East Foundation was working with the Greek government to develop a youth organization. Adams wrote that,

Consequently, the first ‘Future Farmers of Greece,’ organization had its beginning. A national chapter was written up by the supervisors of the Near East Foundation work, and presented to the Greek courts for approval in accordance with Greek law. By the end of 1933, two chapters had been organized and some experience gained in developing rounded out long-time programs of work. (p. 190)

Adams reported, “In 1934, five new clubs were organized making a total of seven chapters, with an enrollment of 140 boys” (p. 190). The FFG chapters “organized its yearly programs along four lines - recreation, agriculture, cultural improvement and health sanitation” (p. 190).

At the 11th Annual National FFA Convention in October 1938, Dr. H. B. Allen (1939), Director of Education for the Near East Foundation, delivered an address titled “Future Farmers in Other Lands.” Allen stated, “I bring you greetings and best wishes from the Future Farmers of Greece, the Future Farmers of Bulgaria, and the Progressive Farmers of Albania” (p. 236). Allen expressed his thanks to the Future Farmers when he stated, “In developing your fine organization during the past 11 years, you, and others before you, have built much better than you knew; the influence of your high ideals and sound principles is much wider than you realize” (p. 236).

Future Farmers of Japan

Immediately following World War II, America was actively involved with rebuilding the country of Japan. Efforts were being made...
to improve the educational institutions across Japan. In order to improve agricultural education programs, the Future Farmers of Japan was created in 1950. Tenney (1977) stated, George Lewis, former national president of the FFA, made a report at the 1951 FFA convention on his visit with the Future Farmers of Japan. It was reported that Ivan Nelson, a former teacher of vocational agriculture attached to General MacArthur’s staff in the Army of Occupation, had been influential in the development of the Future Farmers of Japan. (p. 119 & 120).

Meaders (1985) reported that the FFJ, “...continues as a strong youth organization for boys and girls who are students of vocational agriculture. Its three goals of leadership, social character, and scientific character have provided a focus for promoting agricultural education” (p. 11).

Future Farmers of Canada

Immediately following World War II, agricultural education was expanding rapidly in Canada as in the United States. The Future Farmers of Canada organization was created in January 1947. One of the first chapters of the FFC was the Creston Valley chapter from Creston, British Columbia. The National FFA Archives contains copies of the FFC Creed and Bylaws. Figure 2 below contains the Creed of the Future Farmers of Canada.

Creed of the
Future Farmers of Canada

I believe in the future of farming and that life on a farm is both honorable and satisfying.

I believe that success in farming comes through a scientific attitude, efficiency, hard work and determination.

I believe in being a good citizen...honest and fair in all my dealings.

I believe in accepting responsibilities and doing my part in my home, school and community.

I believe that serving my country, helping others, and doing my best in my vocation will lead to a happier, fuller life.

Figure 2. Creed of the Future Farmers of Canada

The Future Farmers of Canada adopted a crest as its emblem. The crest consisted of a tree, a plow, a maple leaf, and the sun. The tree symbolized growth, the plow labour in agriculture, the maple leaf represented Canadian heritage, and the rising sun represented the future. The FFC included three degrees; Farmhand (bronze), Chapter Farmer (silver), and Provincial Farmer (gold). According to Tenney (1977), “The Future Farmers of Canada sent representatives to the national FFA conventions in 1952 and 1953” (p. 120) and in 1954 the Canadian Ambassador to the United States was a speaker at the convention.

Future Farmers in Southeast Asia and the Pacific

The Future Farmers of the Philippines was established in 1953. Many of the components of the FFP were adopted from the Future Farmers of America. In a letter to the Supervisor of Agricultural Education in the Philippines (Tenney, A.W., 1950-1957, Tenney to A.G.
Tenney wrote, “This is to advise that you have our permission to use the materials in our Official Manual and other items which may be appropriate for you to use in the Philippines. We can see no objection to your using these since your organization will be the Future Farmers of the Philippines.”

FFP officers include the President, Vice President, Secretary, Treasurer, Press Relations Officer [Reporter], Sergeant-at-Arms [Sentinel], and Advisor. The emblem of the FFP is shown in Figure 3 below. It includes eight symbols including rising sun, plow, owl, crops, and flag which are similar to symbols on the FFA emblem. It also includes the words Future Farmers of the Philippines, FFP, Vocational Agriculture and 1953, the year FFP was founded. The degrees of membership in the FFP are Greenhand (bronze), Chapter Farmer (silver), District Farmer (gold pin), Filipino Farmer (gold key). The organization also had the Master Filipino Farmer of the Year, Honorary Chapter Farmers, Honorary Filipino Farmers, and Collegiate FFP members (Future Farmers of the Philippines, 1959).

Figure 3 below contains the emblem of the Future Farmers of the Philippines. Table 1 lists the emblem symbol, the office it represents and the description of the symbol’s meaning.
Table 1
Future Farmer of the Philippines’ Emblem Symbols and Their Meaning (FFP, 1959)

<table>
<thead>
<tr>
<th>Emblem Symbol</th>
<th>Associated Office</th>
<th>Description</th>
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<tbody>
<tr>
<td>Rising Sun</td>
<td>President</td>
<td>Progress, skills, enlightenment and the token of a new era in agriculture,</td>
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<td></td>
<td></td>
<td>brotherhood, and cooperation.</td>
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<tr>
<td></td>
<td></td>
<td>labor, industry and tillage of the soil as well as agriculture which is the</td>
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<td></td>
<td></td>
<td>basic industry of the Filipino people.</td>
</tr>
<tr>
<td>Plow</td>
<td>Vice President</td>
<td>Wealth and economic stability of the nation.</td>
</tr>
<tr>
<td>Rice and other crops</td>
<td>Secretary</td>
<td>National unity because as a patriot and as a farmer he kept accurate records</td>
</tr>
<tr>
<td></td>
<td></td>
<td>of his business and his activities to guide his countrymen.</td>
</tr>
<tr>
<td>Picture of Jose P. Rizal</td>
<td>Treasurer</td>
<td>Loyalty and unity of purpose</td>
</tr>
<tr>
<td>Filipino flag</td>
<td>Press Relation Officer (Reporter)</td>
<td>Learning and the records of achievements of the nation.</td>
</tr>
<tr>
<td>Head of a Carabao</td>
<td>Sergeant-at-Arms</td>
<td>Knowledge and time-honored wisdom</td>
</tr>
<tr>
<td>Owl</td>
<td>Advisor</td>
<td></td>
</tr>
<tr>
<td>Book with Torch</td>
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</table>

The *Future Farmers of Australia* was probably established in the early 1950s. In October 1950 Tenney (Tenney, A.W., 1950-1957, Tenney to A. R. Ninnes, October 24, 1950) wrote to the Advisory Teacher of Agriculture at the South Australia Department of Agriculture, stating, “It would not be a difficult undertaking to organize the Future Farmers of Australia. The first step would be to study the official manual of our organization and revise it so that it would meet your needs.” In a subsequent letter (Tenney, A.W., 1950-1957, Tenney to A.R. Ninnes, July 10, 1953), Tenney wrote, “We are very glad to learn of the development and growth of the Future Farmers of Australia. It is significant that you are holding a State Convention the first week of September” [1953]. In late 1955, a high school principal in American Samoa requested permission to establish an FFA chapter. Tenney (Tenney, A.W., 1950-1957, Tenney to M.J. Senter, December 30, 1955) wrote that, students enrolled in high school in Samoa will not be eligible to take part in contests sponsored for and by the Future Farmers of America.

Tenney explained that, The Congress of the United States extended our program a few years ago that made possible a working relationship with Hawaii [not yet a state] and Puerto Rico. We are not in a position to assist you officially until the authorization is given by the Congress to extend the program to Samoa.

Tenney even suggested that, “If you wish to organize the Future Farmers of Samoa, we shall be very glad to provide complimentary copies of appropriate literature for you to use.”

At the same time interest was expressed by vocational agriculture teachers on the island of Guam to establish Future Farmers’ chapters. In 1956, Tenney (Tenney, A.W., 1950-1957, Tenney to H.P. Adelbai, December 19, 1956) wrote that, “I am interested to learn in your letter of November 29, that you want to form a chapter of the Future Farmers of America on Guam. I regret to advise that at the present time the vocational
agriculture department in Guam is not qualified to have an FFA chapter that can affiliate with the national organization.”

This was because at that time the National Vocational Education Act did not include Guam.

Future Farmers in Africa and the Middle East

The National FFA Archives includes letters referencing the Future Farmers of Liberia (Tenney, A.W., 1950-1957, Tenney to F.B. Sands, March 14, 1955), the Young Farmers of South Rhodesia (Tenney, A.W., 1950-1957, Tenney to D. E. Baker, May 19, 1952), and the Future Farmers of Israel (Tenney, A.W., 1950-1957, Tenney to M. Aloni, October 26, 1955). Letters indicate that a chapter of the Future Farmers of Israel was established at Givat Ada. Letters were also found from officials in Iraq in reference to future plans to create “an appropriate youth organization in the field of agriculture” (Tenney, A.W., 1950-1957, Tenney to J. H. Lintner, June 5, 1957). Other documents were found that referred to the Future Farmers of Egypt but no additional information about this organization was located.

Future Farmers in Central and South America

Several future farmers’ organizations were established in Central and South America. The Future Farmers of Panama was established in 1955. The official name of the organization is Asociación Nacional de Futuros Agricultores de Panamá. In 1960, E.J. Johnson, Program Planning Specialist in the U.S. Agricultural Education Branch, visited Peru to help officials develop the Future Farmers of Peru. The FFP even received permission from the FFA to have the official FFA manual translated into Spanish for the use of its members (Tenney, A.W., 1950-1957, Tenney to J. G. Coombs, April 7, 1955).

The agenda for the Committee on International Educational Activities for the Future Farmers of America (1967) meeting included references to the Future Farmers of Mexico, Future Farmers of Colombia, the Future Farmers of Peru, and the Future Farmers of Costa Rica. The committee recommended to “develop guidelines to outline how the FFA would be used to supplement agricultural education programs in other countries, and recommended conducting a “World FFA Seminar” in 1970 (Future Farmers of America, 1967).

International Programs

In 1947, the National FFA Officers invited Lord Inverchapel, Ambassador from Great Britain to address the national convention (Tenney, 1977). Accompanying him on his trip to Kansas City were six members of the National Federation of Young Farmers Clubs of Great Britain. At the same time six FFA members traveled to Britain for a tour. This led to the development of an international exchange program between the two organizations.

It was reported in the FFA at 25 booklet (Farrar, 1956),

One of the convention activities was the approval of a plan for establishing an annual exchange program between the FFA and the Young Farmers Clubs of Great Britain. Four Future Farmers made the trip to Britain in 1949 and four British Young Farmers came to this country. (p. 41)

This exchange program continued for many years. In the history book Blue Jackets Gold Standards (National FFA Organization, 2003), it was stated that, “Two 18-year-olds represented FFA in the organization’s British Exchange Program in 1953. David Boyne, Marlette, Michigan, and L. Philip Brouillette...Richford, Vermont, spent four summer months that year in Great Britain visiting in homes of young farmers” (p. 26).

In 1963, the FFA contracted with the Peace Corps to sponsor agricultural development projects in West Pakistan. A.W. Tenney traveled to West Pakistan in 1965 to observe the projects and meet the FFA members who volunteered to spend two years working in the country (Tenney, 1965). Building on the FFA’s success with exchange programs, the FFA Work Experience Program was developed in 1969. This program would later be called Work
Experience Abroad, and World Experience in Agriculture. Other international activities in which the FFA participated included the Congress/Budestag Exchange Program in West Germany, and the World AgriScience Studies Program (“Making the Grade Across the Ocean,” 1988).

Throughout the 1960s and 1970s, FFA involvement in international agricultural education continued to grow. Joe Martinez, 1968-69 National FFA Vice President, journeyed to Cali, Columbia to represent FFA at the 1969 National Convention of the Future Farmers of Columbia. Martinez’s (1969) speech included the following passage,

It was interesting to me to note that your liberator, Simon Bolivar, whom you regard as the Father of your nation is symbolic of the Treasurer’s post in the FAC, just as George Washington, the Father of our nation is symbolic of the FFA Treasurer. Your reference to Bolivar and the respect you show your country and its leaders is indicative to me that the FAC like the FFA seeks to encourage patriotism for country and fellow man.

The Future Farmers of America also got involved in improving production agriculture practices in foreign countries. In 1972, the FFA worked with the Iowa FFA Association to develop a swine improvement program in Jamaica (Tenney, 1977, International Programs, n.d.). Tenney (1977) reported that,

After Lennie Gamage and Tim Burke, national FFA president in 1972, visited the Youth Development Agency and Youth Clubs in Jamaica, the FFA offered to provide high quality, pure-bred swine to be given to the youth camps in Jamaica to launch a pig chain to upgrade swine (p. 122).

In 1973, Lennie Gamage, former National FFA Officer, and Director of FFA International Programs, traveled to Australia to deliver the keynote speech titled “FFAustralis” to the 1973 convention of the Future Farmers of Australia (Tenney, 1977). In 1974, H. Nevil Hunsicker traveled to Medellin, Columbia to deliver a speech titled “The Role of Vocational Agriculture and Future Farmers Programs in Rural Development” to the First General Meeting of the Committee on Interamericano de Educación Agropecuaria (Hunsicker, 1974a). On the same trip Hunsicker gave another speech titled “The Role of Student Organizations in Vocational Agricultural Education” to the 5th National Convention of Futuros Agricultores de Columbia (Hunsicker, 1974b).

Over the decades, FFA continued to reach out to international organizations to offer international exchange programs to send FFA members to other countries, and bring young agriculture students to the United States. In 1989, the FFA International Department organized the “Experience America” program (El Salvador Students Experience America, 1989). One hundred El Salvador high school students traveled to the USA and spent two weeks with FFA families in California, Illinois, Iowa, Kentucky, Louisiana, Nebraska, New Mexico, Ohio, Oregon, South Dakota, Virginia, and Wisconsin. The project was sponsored by Partners, a non-profit organization dedicated to furthering understanding of Central American and Caribbean countries.

International Travel Seminars

Throughout the 1960s and 1970s, the FFA began offering international study tours to Central and Eastern Europe, Australia and New Zealand, Central and Northern Europe, and South America. In the early 1970s, Lennie Gamage offered study tours to New Zealand, Thailand, the Philippines, Iran, Japan and Korea. The first World Conference in Agricultural Education for Youth and Adult Leaders was held in conjunction with the 1976 National FFA Convention. One of the major activities of the conference was the First International Agricultural Olympics “consisting of individual competitive activities in soil and plant judging, agricultural mechanics, tractor operation and maintenance, and livestock judging” (Tenney, 1977, p. 124).

In 1978-79, the national FFA organization created the Proficiency Travel Seminar for the finalists and winners of the national FFA Proficiency Awards. The first seminar took place in March 1979. Countries visited over the years included England, France, Belgium,
Luxembourg, West Germany, Liechtenstein, Austria, Hungary, Italy, Switzerland, Czechoslovakia (later the Czech Republic and Slovakia), Poland, Sweden, Finland, Denmark, the Netherlands, and Ireland. In the late 1980s, the FFA developed the Stars on Tour program (Mattics, 1988). It included the finalists for the Star Farmer of America and Star Agribusinessman of America. These two travel seminars were eventually combined to include both the star finalists and the proficiency finalists. In 1999, the FFA established the International Leadership Seminar for State Officers. This trip introduces State FFA Officers to international agricultural production and leadership development opportunities in Europe.

Eventually, state FFA associations and local chapters began participating in international programs. In the early 1990s, several chapters from across the country participated in the Russian exchange program with agricultural schools in the Russian Federation (former Soviet Union) (Zillinger, 1995). Six Pennsylvania FFA members from the Williamsburg chapter participated in a six-month Poland Exchange Program in 1994 (Bruce, 1995).

Throughout the decades, the National FFA Officers also got a chance to experience international agricultural education. The National Officer Good Will Tour to visit FFA Foundation Sponsors began in 1947. In the 1980s this trip was expanded into the International Experience Tour for National Officers and included a trip to Japan sponsored by Mitsui & Company, a major Japanese trading company. The 1989 National Officers tour traveled to Japan, Thailand, and China. “The officers also met with members of the Future Farmers of Japan and the Future Farmers of Thailand (“West Meets East,” 1989, p. 12).

Conclusions and Recommendations

The establishment of the Future Farmers of America in 1928 and its subsequent growth in size and scope was noticed around the world. Agricultural education professionals from dozens of other countries wanted to know about the organization and how it helped motivate young rural boys to study vocational agriculture and choose agriculture as a career field. Over the course of several decades, many countries started their own “future farmer” organizations. The most successful was the Future Farmers of Japan which is a large and vibrant organization to this day. As the FFA grew, so did its involvement in international activities.

Based on the results of this historical research study, it can be concluded that the Future Farmers of America organization played a vital role in helping to establish similar “future farmer” youth organizations in numerous countries around the world.

The FFA has worked with many other countries to offer exchange programs, study tours, and travel seminars for state FFA officers, award winners, and national FFA officer teams. The FFA has also offered Work Experience Abroad, World Experience in Agriculture, and the World AgriScience Studies Programs. This research found that international agricultural education activities have been a major component in the 82 year history of the Future Farmers of America and the National FFA Organization. FFA leaders, staff, national officers, advisors, and members have traveled the world to offer assistance, gain valuable international work experience, or study agricultural production, policy, and culture in numerous countries in every corner of the globe.

Based on these conclusions, I recommend that a comprehensive assessment of worldwide agricultural education programs should be conducted. Sources of information for such an assessment would be Ministries of Education and offices of vocational education in countries to determine the status of their agricultural education programs and agricultural youth organizations such as future farmers’ and young farmers’ clubs. The National FFA Organization should reconstitute the Committee on International Educational Activities. It should work to consolidate all information about agricultural education/FFA involvement in international agricultural activities and make regular reports to the National Association for Agricultural Education (NAAE), American Association for Agricultural Education (AAAE), the National Association of Supervisors of Agricultural Education (NASAE), and at National Ag Ed Summit meetings. The National
Council for Agricultural Education should work with FFA International Activities officials to organize and lead a revised emphasis on international agricultural education and future farmer organizations for the youth of the world.

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JAMES J. CONNORS is Department Chair and Associate Professor in Agricultural Education & 4-H Youth Development at the University of Idaho, 1134 West 6th Street, Moscow, Idaho 83844-2040, jconnors@uidaho.edu.
Leadership Curriculum and Materials Used by High School Agricultural Science Teachers: A National Study of the Pre-LifeKnowledge Days

A. Christian Morgan
Nicholas E. Fuhrman
Diana L. King
Frank B. Flanders
University of Georgia
Rick D. Rudd, Professor
Virginia Tech University

Agricultural science programs have provided many opportunities for leadership education through classroom, supervised agricultural experience (SAE), and FFA Organization activities. Past studies have focused on leadership developed through activities such as career development events (CDE), SAE activities, FFA Organization conventions, and other intra-curricular activities; however, little research has focused on the type of leadership curriculum and materials used to teach leadership in agricultural science classrooms. This study used a qualitative survey to determine what leadership curriculum and materials were being used by agricultural science teachers to teach leadership prior to the release of the LifeKnowledge curriculum. To understand the impact of LifeKnowledge in follow-up studies, a baseline must first be established for comparison. This study found that agricultural science instructors used a wide variety of curriculum and resources to teach leadership. The most popular resources being used were text books and state provided curriculum materials; however, no single curriculum was used by the majority of participants. Some participants indicated using curriculum and resources to teach leadership which contained little, if any, leadership content. Agricultural science instructors may have mixed views on the definition of the term “leadership,” therefore additional research is needed to determine how agricultural science instructors define leadership and the methods they use to build leadership skills in their students.

Keywords: leadership curriculum, secondary agricultural education, LifeKnowledge

Leadership skills are not only desired by employers, but needed for a productive and “functional” society (Brooks et al., 2008; Gardner, 1990; Kouzes & Posner, 2007). To help meet this need, leadership has been taught in high schools through a variety of venues, including leadership courses, career and technical student organizations, student councils, and other school-based organizations. Within career and technical education, agricultural science courses have provided many opportunities for leadership education through classroom, supervised agricultural experience (SAE) projects, and FFA Organization activities. While studies have sought to determine leadership abilities attributed to involvement in SAE and FFA Organization activities, little has been done to assess what leadership education is occurring in the agricultural science classroom. In 2004, the National FFA Organization sought to improve the leadership instruction within agricultural education by developing the LifeKnowledge curriculum (LifeKnowledge, 2011). However, before the impact of LifeKnowledge can be assessed, a baseline must first be established for comparison. This study sought to capture data on the leadership materials being used by agricultural science instructors prior to 2004. With knowledge of the curriculum materials being used to teach
leadership in agricultural education classrooms prior to LifeKnowledge, it will be possible for future research to accurately assess the impacts of LifeKnowledge.

Leadership development is becoming a focus of many public schools across the country, and in a few cases schools and school districts have designed and implemented curriculum in order to teach leadership knowledge and skills to youth (Commonwealth of Virginia Board of Education, 2001; School District of Washington, 2001; University of Texas of the Permian Basin, 2009; Virginia Division of Policy and Public Affairs, 2001; Vital, 2007). Prior to this trend, Gardner (1990) documented that leaders are needed in all levels of our society, while Figura (1999) warned of an impending leadership void among the workforce. Indeed, students who have been taught leadership are better prepared to act in a leadership capacity because they better understand the phenomena of leadership as a personal and attainable undertaking (Ricketts & Rudd, 2002). If a goal of high school education is to produce capable citizen leaders, it is natural that leadership should be part of the curriculum.

Leadership Development in High Schools

Public secondary schools have a history of providing programs for leadership development. In addition to student councils, debate clubs, and other on-campus organizations, many high school career and technical programs develop leadership skills in students through a variety of activities such as the National FFA Organization, Family, Career and Community Leaders of America (FCCLA), Distributive Education Clubs of America (DECA), and SkillsUSA (White, 1982). Specific to agricultural science programs, the National FFA Organization has worked hand-in-hand with agricultural science teachers, providing an avenue for young people to exercise and develop their leadership skills (National FFA Organization, 2011). The FFA mission statement asserts the goal of the organization is to “…make a positive difference in the lives of students by developing their potential for premier leadership, personal growth, and career success through agricultural education” (National FFA Organization, 2011, para. 1).

There is a unique link between high school agricultural science programs and the intra-curricular National FFA Organization. Within these classrooms, agricultural science instructors teach leadership skills to students, who then apply that knowledge by engaging in leadership activities provided through local, district, state, and national activities (Hughes & Barrick, 1993). Agricultural science programs provide a wide variety of opportunities for leadership development during classroom instruction, SAEs, and FFA activities (Hillison & Bryant, 2001; Hoover, Scholl, Dunigan, & Mamontova, 2007) which, according to the Agricultural Education Program Model, is integral to preparing students for further education and employment (Hughes & Barrick, 1993). However, little is known about the curriculum and materials being used in the high school classroom to teach leadership.

Student FFA Involvement

A substantial amount of research has been conducted to analyze the impact of FFA involvement on students over the past three decades. Townsend and Carter (1983) found student self-perceived leadership competencies had a significant correlation with FFA participation, and their results suggest leadership is enhanced with increased FFA activity. In addition, Ricketts and Newcomb (1984) surveyed high school students and discovered that students enrolled in agricultural courses and who were FFA members possessed significantly more leadership and personal development abilities than did students not enrolled in agricultural courses.

The relationship between FFA involvement and leadership development is strong. Ricketts and Newcomb (1984) and later Wingenbach (1995) found member engagement within the local FFA chapter had a significant positive relationship with self-perceived youth leadership and life skill development. Likewise Rutherford, Townsend, Briers, Cummins, and Conrad (2002) surveyed FFA chapter officers attending the National FFA Organization’s Washington Leadership Conference (WLC) and
found a significant positive relationship between self-perceived leadership skills and level of FFA involvement. This positive correlation reinforces the positive relationship between FFA activity and perceived leadership skills. Similarly, a three-year longitudinal study revealed that the WLC had a positive impact on student attendees (Stedman, Rutherford, Rosser, & Elbert, 2009). Further, Anderson and Kim (2009) found that students preferred the school-based leadership training found in FFA and agricultural science classes second only to high school sports.

The preceding studies help to illustrate the benefits of youth involvement in extra-curricular and intra-curricular activities, especially in the development of leadership skills. However, not all students engage in these activities. The conceptual model used in this study was Finch and Crunkilton’s (1999) Program System Model (Figure 1) which illustrates how students (input) enter a secondary program (process), and then graduate from this program (output). The secondary program consists of four elements: faculty, resources, curriculum, and intra-curricular activities. Within agricultural science programs, the presentation of leadership concepts and the development of leadership skills rely heavily on these four elements; yet, if students are not participating in extra- and intra-curricular activities, classroom leadership instruction will be the process by which they develop leadership skills. Specific classroom instruction in leadership would provide leadership exposure for all students, regardless of participation in leadership activities, and aid in developing suitable levels of leadership skills in high school students (Carter & Spotanski, 1989; Ricketts & Rudd, 2001). This study sought to expand the understanding of the process component of the Finch and Crunkilton (1999) model prior to the release of the LifeKnowledge curriculum.

There are leadership textbooks designed for use in agriscience programs (Cengage, 2011; Pearson, 2011), and some states have developed leadership curriculum (Commonwealth of Virginia Board of Education, 2001; Instructional Materials Service, 2011; North Carolina State University, 2011; Virginia Division of Policy and Public Affairs, 2001) to address local needs. Although agricultural education has accepted the charge to teach leadership skills, no studies have been conducted to determine what curriculum has been used in agricultural science classrooms prior to the release of the LifeKnowledge curriculum.

![Figure 1. Program System Model. From Finch and Crunkilton, 1999, Curriculum development in vocational education and technical education: Planning, content, and implementation (p. 27), Boston: Allyn and Bacon.](image-url)
A Leadership Curriculum for Youth

With no nationally accepted agricultural leadership curriculum available prior to LifeKnowledge, what materials were instructors using to teach leadership in agriscience programs? Although high school agricultural science instructors have the skills to develop their own curriculum materials, they prefer to use pre-existing materials (Wingenbach & Gartin, 2000), and the use of a quality curriculum provides a strong foundation for quality teaching to occur (Swan, 1996). Boccia (1997) points out “there is a meager base of programmatic guidelines for successful student leadership in schools” (p. 76). Though some teaching materials are available, it appears there is a need for a comprehensive leadership curriculum for youth.

Research has been conducted to determine the impact of intra-curricular activities on youth leadership development (Rutherford, Townsend, Briers, Cummins, & Conrad, 2002; Seevers & Dormody, 1995; Townsend & Carter, 1983; Wingenbach, 1995) and the amount of leadership being taught in agricultural science classrooms (Morgan & Rudd, 2006). However, little research has been done to determine the curriculum materials used to teach leadership in high school agricultural science classrooms. Although many have speculated on the positive impact of the National FFA’s LifeKnowledge curriculum in the high school agricultural science classroom, to assess such impact one must first determine the leadership curriculum used prior to its adoption.

Purpose and Objectives

As Part One of a two-part study, the purpose of this study was to determine the types of curriculum being used by agricultural science instructors to teach leadership prior to the adoption of the LifeKnowledge curriculum. A follow-up study will then be conducted to determine current use of the LifeKnowledge curriculum and to measure trends in curriculum use pre- and post-LifeKnowledge. Specifically, the objectives of this study were to determine if:

1. Instructor-developed curriculum were being used for leadership instruction prior to the adoption of the LifeKnowledge curriculum;
2. Commercially available curriculum were being used for leadership instruction prior to the adoption of the LifeKnowledge curriculum; and if
3. Commercially available text books were being used for leadership instruction prior to the adoption of the LifeKnowledge curriculum.
4. Determine the intensity with which each resource incorporated leadership concepts.

Methods

This study was conducted using survey research and was part of a larger study. The National FFA Organization was utilized as the source of participant contact information. The population for this study was high school FFA chapter advisors at agricultural science programs during the time of data collection; the 2003-2004 school year. It is required that the FFA advisor be the agricultural education teacher, so this population could also be termed all high school agricultural education teachers during the 2003-2004 school year (FFA Constitution. art XI, § B). At the time of this study, there were 7,193 FFA chapters throughout the nation (National FFA Organization, 2002). To achieve a 95% confidence level with 5% sampling error, a sample size of 367 was needed (Dillman, 2000). To account for inactive programs, incorrect addresses, and other potential coverage error issues, a sample size of 400 was used. A list of FFA chapters was provided by the National FFA Organization for this study, and the sample was selected using simple random selection (Agresti & Finlay, 1997). FFA advisors in five states (Kansas, Maine, Nebraska, New Jersey, and Pennsylvania) where the LifeKnowledge curriculum had been pilot tested were not included in this sample to eliminate potential influence of the LifeKnowledge curriculum on
the attempt to establish baseline data prior to *LifeKnowledge* becoming commonly used.

Participants were asked, “What leadership curriculum or text book are you currently using to teach leadership?” Responses to this question were sorted and grouped using the constant comparative method (Lincoln & Guba, 1985). Domain analysis was used to analyze all qualitative data following the strategies outlined by Spradley (1980). An expert panel of curriculum and leadership specialists with over 47 years of combined experience developing and evaluating agricultural education curricula grouped the leadership curriculum materials and related text books by common theme (domain). The expert panel then further categorized the types of leadership resources being used based on the intensity with which each resource incorporated leadership concepts. A scoring rubric was used which assessed intensity based upon number of leadership standards addressed from the National Agriculture, Food, and Natural Resources (AFNR) Career Cluster Content Standards (National Council for Agricultural Education, 2009), hours of instruction and activities, and level of lesson objectives according to Bloom’s Taxonomy (Bloom, Engelhart, Furst, Hill, & Krathwohl, 1956). Experts categorized each resource along a four-point scale: 1 (*unknown incorporation of leadership concepts*), 2 (*minimal/limited incorporation*), 3 (*moderate incorporation*), and 4 (*broad/thorough incorporation*). Copies of curriculum materials were procured for evaluation; materials from individual state curriculum offices were unable to be procured, therefore, for the purpose of this study, all state provided curricula were assumed to be governed by state standards which would include leadership concepts comparable to those in the AFNR Content Standards.

Data collection followed a modified version of the Tailored Design Method (Dillman, 2000) which employed bimodal data collection to reduce cost (Brashears, Akers, & Bullock, 2003). Participants were mailed a pre-notice letter notifying them that they had been selected to participate in this study, and instructions were provided within the letter explaining how they could access the survey instrument from the Internet. Four days later a paper instrument was mailed to the participants who had not already responded to the internet survey. A thank you/reminder postcard was mailed ten days later. A second survey instrument was mailed ten days following that to participants who had not yet responded. Eight days later phone calls were made to participants who had still not responded. An additional ten days were allowed for the collection of electronic and mailed responses. The final response rate was 41.8% (*n* = 167).

**Findings**

Of the 167 participants, 108 responded to the open-ended curriculum question, with 20 stating that no curriculum resources were used (“none”), 54 used only one curriculum resource, and 34 used two or more curriculum resources. Participant responses that included multiple curriculum resources were separated and each resource was listed in an appropriate domain/category. Table 1 summarizes the overarching domains and the frequency with which they appeared in the raw data.

The text *Leadership, Personal Development, and Career Success* from Cengage was the most popular resource. The second most popular material was curriculum provided through state curriculum offices (*n* = 25). Within this group, 11 participants used curriculum from the Instructional Materials Service (IMS) in Texas, four participants used materials from the Instructional Materials Lab (IML) in Missouri, two participants used materials from the Curriculum and Instructional Materials Center (CIMC) in Oklahoma, and eight participants stated they used materials from other states. Eighteen participants used the *Official FFA Manual* or *Official FFA Student Handbook* to teach leadership. In addition, 15 participants developed their own curriculum materials. These materials included “handouts,” “just notes,” “personal experience,” “articles,” “state FFA officer materials,” “Washington Leadership Conference materials,” and “various resources from college text books and Internet sources.”
Table 1
Leadership Curriculum Materials Used by Agricultural Science Instructors (n = 88)

<table>
<thead>
<tr>
<th>Curriculum Material Used (domain)</th>
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<tbody>
<tr>
<td>Text: Leadership, Personal Development, and Career Success</td>
<td>27</td>
</tr>
<tr>
<td>State provided curriculum</td>
<td>25</td>
</tr>
<tr>
<td>Official FFA Manual or Official FFA Student Handbook</td>
<td>18</td>
</tr>
<tr>
<td>Instructor developed materials</td>
<td>15</td>
</tr>
<tr>
<td>Parliamentary procedure materials</td>
<td>12</td>
</tr>
<tr>
<td>Agricultural science textbooks</td>
<td>9</td>
</tr>
<tr>
<td>Miscellaneous leadership books</td>
<td>9</td>
</tr>
<tr>
<td>Text: Developing Leadership and Personal Skills</td>
<td>3</td>
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Note: Responses do not add up to 88 because some participants used more than one curriculum resource.

Parliamentary procedure materials were used by 12 participants as leadership curriculum. Nine participants used other agricultural science text books, with the most popular being Agriscience: Fundamentals and Applications by Cengage. A variety of miscellaneous books and materials were used by nine of the participants to teach leadership. These materials included Ziglar’s I Can curriculum, CEV multimedia videos, Success in the World of Work software, Character First, How to Win Friends and Influence People, The 7 Habits of Highly Effective People, The Leadership Challenge, Developing the Leader within You, and John Deere business curriculum. Three of the respondents stated they used the Pearson text Developing Leadership and Personal Skills to teach leadership.

Eleven participants stated that leadership was not taught in a specific course, but was taught throughout many courses within the agricultural science curriculum. Within this domain, responses included the following:

- “Indiana has 11 approved agricultural courses. Leadership is not one of them. It is taught throughout all 11 courses.”
- “Leadership is not formally taught from a text book. Rather, leadership, goal setting, and responsibility are taught as part of the science curriculum. Each student is given an agenda book in the beginning of the year. Lessons are given on goal setting, time management, and prioritizing, with assessment being part of the agenda book grade.”
- “We teach agriculture leadership everyday in our agriculture program. We were able to get 70% of our students to get involved in an after school activity to show their leadership. We just received a new book to use on leadership; however, I do not use a book at this time. I teach them from my own values.”
- “No text is used – other than the Official FFA Manual. Leadership skills and curriculum are included in, or should be included in, every course we teach!”
- “I teach leadership development in all my courses. We spend a couple of weeks intensely and then it is integrated throughout the year. I use several resources: My personal experience as a past state officer. I also use [Cengage’s] Leadership book, but I also refer to several resources I have acquired from different seminars I have attended.”
- “Integrated into a unit within each course taught; FFA Student Handbook, parliamentary procedure workbook; and Bits and Pieces.”
- “I currently do some leadership activities with my 7th and 8th graders in their FFA unit - I do a leadership and
conflict resolution unit with my freshman – Also, talk about leadership with my seniors in advanced ag and with all agribusiness/entrepreneurship class members.”

The expert panel of curriculum and leadership specialists further categorized participant responses based on the intensity with which each curriculum resource incorporated leadership concepts recommended by National Agriculture, Food, and Natural Resources Career Cluster Content Standards (National Council for Agricultural Education, 2009). Modal responses from the panel of experts are presented, using the previously identified curriculum resource domains, in Table 2.

A comparison of Tables 1 and 2 reveals that two of the five most often used curriculum materials by agricultural science instructors to teach leadership prior to the adoption of the LifeKnowledge curriculum had minimal/limited incorporation of leadership concepts. Half of the curriculum materials being used to teach leadership prior to LifeKnowledge had broad/thorough incorporation of leadership theory and principles. The researchers were able to review copies of leadership texts mentioned and also state provided curricula from multiple states represented in the study. These state curricula were found to be based upon state standards which included personal leadership development in each case. Instructor developed materials could not be evaluated and, although they may be of excellent quality due to the curriculum training most teachers receive during pre-service activities, were classified as unknown because the level of leadership concepts could not be determined. In addition, it is unknown how each agricultural science instructor interpreted the term leadership or if their interpretation was accurate.

### Table 2

**Level of Incorporation of Leadership Concepts in Curriculum Materials Used by Agricultural Science Instructors**

<table>
<thead>
<tr>
<th>Curriculum Material Used (domain)</th>
<th>Level of Incorporation of Leadership Concepts</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Unknown</td>
</tr>
<tr>
<td>Text: <em>Leadership, Personal Development, and Career Success</em></td>
<td>X</td>
</tr>
<tr>
<td>State provided curriculum</td>
<td></td>
</tr>
<tr>
<td><em>Official FFA Manual or Official FFA Student Handbook</em></td>
<td>X</td>
</tr>
<tr>
<td>Instructor developed</td>
<td>X</td>
</tr>
<tr>
<td>Parliamentary procedure materials</td>
<td>X</td>
</tr>
<tr>
<td>Agricultural science textbooks</td>
<td>X</td>
</tr>
<tr>
<td>Miscellaneous leadership books</td>
<td></td>
</tr>
<tr>
<td>Text: <em>Developing Leadership and Personal Skills</em></td>
<td></td>
</tr>
</tbody>
</table>
Conclusions / Recommendations / Implications

It is apparent from this study that a wide variety of materials were being used to teach leadership in agricultural science classrooms prior to the adoption of the LifeKnowledge curriculum. While the textbook Leadership, Personal Development, and Career Success was the most popular material being used by respondents in this study, there was not a curriculum material or text being used by the majority of instructors. Similarly, state curriculums were popular, but were also not used by a majority of instructors.

Participants exhibited a variety of practices when incorporating leadership curriculum into their agriscience programs. Some instructors focused on the Official FFA Manual as their source for leadership knowledge, while others focused on parliamentary procedure manuals. Still others used materials available from popular sources, and some instructors relied on personal experiences for teaching leadership. While each of these curriculum materials has their strengths, it is evident that there was a lack of consistency in what leadership knowledge base was being used for leadership instruction prior to LifeKnowledge. With the variety and variability of options being used, the amount of exposure to leadership education within an agriscience classroom is difficult to gauge. Some instructors view leadership through the lens of Kouzes and Posner’s The Leadership Challenge, which is widely used and rooted in leadership research (Kouzes & Posner, 2007), while others view it through the lens of a general agriscience textbook, which may contain only an overview of FFA and a few pages on interpersonal skills.

This study revealed two primary observations. First, there is a need for a common definition of leadership that all agricultural science instructors can share. Just as agricultural science instructors have a common definition for animal science or horticulture, there should be an accepted definition for leadership. Second, there is a need for appropriate curriculum that all agricultural science instructors can access to use as a foundation for leadership instruction. Simonsen and Birkenholz (2008) also recommended that core leadership content topics be identified and taught nationally in secondary agricultural education programs. Since the time this study was conducted, the National FFA Organization has helped to address both of these observations with the LifeKnowledge curriculum. A “standardized” definition of leadership and nationally accepted leadership curriculum would not only add to the process component of the Finch and Crunkilton (1999) model, but would aid in the evaluation of student leadership knowledge nationally.

A follow-up study should be conducted to determine current use of the LifeKnowledge curriculum and to measure trends in curriculum use pre- and post-LifeKnowledge. The results of this study should be helpful in determining the impact of the LifeKnowledge curriculum now that baseline data prior to its release are available. Research should be conducted to determine how agricultural science instructors define leadership and whether the LifeKnowledge curriculum has replaced curriculum materials found in this study, been added to materials already in use, or not been adopted. In addition, research should determine if development of LifeKnowledge has resulted in more leadership education incorporated into agriscience classes, more stand-alone leadership courses offered, or had no effect on the amount of leadership education included in agriscience programs. Perceptions of students, teachers, and administrators should be assessed to determine if changes have occurred in the perception of agricultural education as a source of leadership development.
References


A. CHRISTIAN MORGAN is an Assistant Professor in the Department of Agricultural Leadership, Education, and Communication at the University of Georgia, 130 Four Towers, Athens, GA 30602, acm@uga.edu.

NICHOLAS E. FUHRMAN is an Assistant Professor and Extension Specialist in the Department of Agricultural Leadership, Education, and Communication at the University of Georgia, 139 Four Towers, Athens, GA 30602, fuhrman@uga.edu.

DIANA L. KING is an Assistant Professor in the Department of Agricultural Leadership, Education, and Communication at the University of Georgia, 2360 Rainwater Rd., Tifton, GA 31793, dlking@uga.edu.

FRANK B. FLANDERS is an Assistant Professor in the Department of Agricultural Leadership, Education, and Communication at the University of Georgia, 132 Four Towers, Athens, GA 30602, flanders@uga.edu.

RICK D. RUDD is a Professor and Head of the Department of Agricultural and Extension Education at Virginia Tech University, 2270 Litton Reaves Hall, Blacksburg, VA 24061, rrudd@vt.edu.
How Are We Educating Agricultural Students? A National Profile of Leadership Capacities and Involvement in College Compared To Non-Agricultural Peers

David M. Rosch
University of Illinois at Urbana-Champaign
Natalie Coers
University of Florida

Given the importance of leadership development within the various agricultural professions, a national sample (n=461) of students with agriculture-related majors from 55 colleges was compared to a similarly-sized random peer group from the same institutions. The data were analyzed to compare the agricultural student sample to their peers with respect to a variety of social identities (e.g. race, gender, political leanings); high school and college involvement and leadership positions held within co-curricular activities and organizations; and scores from several measures of leadership-related outcomes. These outcomes included socially responsible leadership practices, leadership efficacy, social change behaviors, cognitive complexity, and the degree to which students participate in socio-cultural discussions. Findings suggest that while agricultural students display similar levels of involvement and leadership in high school and higher levels in college, they do not make some of the same leadership outcome gains in college as the comparison population. These findings hold important implications for the way agricultural educators structure classroom environments and how they advise student organizations.

Keywords: college students, student leadership skills, student involvement

Institutions of higher education have exhibited a strong commitment to leadership development since their inception, preparing professional and societal leaders for many years (Astin & Astin, 2000). Marcketti and Kadolph (2010) stressed, “The importance of leadership education for today’s undergraduate students cannot be underestimated” (p.131). As both future educators of agricultural students and contributors to the agricultural industry as a whole, colleges of agriculture play an important role in preparing students to take on these roles. Schumacher and Swan (1993) recommended the further development of leadership programs for colleges of agriculture, as “students indicated both a strong need and willingness to participate in leadership development programs” (p. 8). A recent study showed that over 1,000 higher educational institutions currently offer leadership development programs of some form (Riggio, Ciulla, & Sorensen, 2003). Part of this increase is attributed to a shifting definition of leadership from a hierarchical, narrow conception to more strongly underscore the importance of developing relationships (Komives, Lucas, & McMahon, 2007) while acting ethically and congruent with one’s personal values (Kouzes & Posner, 2010). These skills are what many describe as necessary for success in contemporary organizations (Friedman, 2007; Seidman, 2007). Leadership and other transferable skills are developed through various means, including training, personal experience, observation and reflection, and education (Brungardt, 1996; Marcketti & Kadolph, 2010; The National Academies, 2009).

Regardless of the continuing shift in definition, “leadership skills” is a general trait
desired by employers seeking job candidates (National Association of Colleges and Employers, 2011; Astin & Astin, 2000). Moreover, the training of a “scientific and professional workforce that addresses the challenges of the 21st century (Doerfort, 2011, p. 9) is one of the six key research priorities of the American Association of Agricultural Educators (AAAE). Powell and Agnew (2007), writing for agricultural educators, emphasized, “leadership is a valued attribute for employers and for society in general, one which is expected of university students upon graduation” (p. 11). Birkenholz and Schumacher (1994) reported a strong need for future agricultural leaders, where educators must develop and implement strategies that develop the future of the field. Ewing, Bruce, and Ricketts (2009) noted the collegiate environment as ideal for leadership development with ample opportunities such as student service programs, collegiate student organizations, and service learning projects. To meet this expectation of leadership attributes, students must be engaged in the numerous opportunities available during their collegiate experience.

Students who participate in co-curricular opportunities available on campus have a clear advantage over students who choose not to engage in these means of leadership development (Astin, 1999; Foubert & Grainger, 2006; Kuh, 1995); Freeman and Goldin, 2008). Additionally, Ewing, Bruce, and Ricketts (2009) noted, “leadership skill and ability may be perceived as higher for members of collegiate organizations when compared with non-members” (p.120). Despite its perceived benefits, student engagement and involvement in leadership development through coursework, programming, and student organizations can be a challenge at colleges and universities. Powell and Agnew (2007) emphasized, “Since student participation in these organizations is usually not required, faculty and organizational advisors often struggle with how to increase student participation in leadership development activities through these organizations” (p. 11). Discovering why some students choose not to participate in such beneficial experiences is an area in need of further exploration (Ewing, Bruce, & Ricketts, 2009). Although Shertzer and Schuh (2004) found that, “student leaders generally will emerge without needing to be pushed and can be trusted to serve in their roles without much supervision because of their leadership experience” (p.127), additional opportunities would continue to deepen the leadership capacity of these students. Connors, Velez, and Swan (2006) observed there may be a gap in student awareness of leadership development opportunities on campus (formal and informal). Investing in student leadership development at all levels of experience and involvement can positively impact both the current and future roles of these young leaders.

Although collegiate student leadership development tends to be a focus for career preparation, it has been well established that leadership development begins prior to college enrollment (Park & Dyer, 2005; Allen, Ricketts, & Priest, 2007). Several researchers have suggested the positive impact of high school or agricultural organization involvement (FFA, 4-H, etc.) on leadership development and preparation in students (Allen, Ricketts, & Priest, 2007). Based on Ajzen’s (1991) Theory of Planned Behavior, Allen, Ricketts, and Priest (2007) inferred “one could predict that students who serve as officers in high school organizations (intention) develop self-efficacy about leadership (perceived behavioral achievement) and will serve as officers and/or in other leadership roles in collegiate and professional organizations (behavioral achievement)” (p. 57). Allen, Ricketts, and Priest (2007) challenged educators to continue asking, “Does the pre-college leadership education experience have any effect on a college student’s involvement in leadership roles while enrolled in college or after graduation?” (p. 56). Transitions in maturity and leadership experience occur from high school involvement to leadership opportunities in collegiate organizations. Connors, Velez, and Swan (2006) stressed that “it is critically important that faculty, advisors, researchers, and administrators in land-grant university colleges of agriculture pay close attention to the leadership development of the undergraduates in their institutions” (p. 95).
Leadership Education in Agricultural Education

Agricultural students, in particular, are no exception to the increasing need for prepared graduates with the skills necessary to lead in their respective communities and careers. Leadership has been associated with agricultural and extension education for decades (Connors & Swan, 2006). The AAAE has joined the call for graduates prepared for positions of influence in their communities, adding 21st Century workforce preparation, the influence of social structures within agricultural education programs, and the creation of engaged, vibrant communities to its current national research priorities (Doerfort, 2011). Based upon the National Standards for Teacher Education in Agriculture adopted by the American Association for Agricultural Education (AAAE), education programs are to develop the skills and knowledge for all content areas teachers may be expected to teach, including the content area of leadership (Simonsen & Burkenholz, 2010). Connors, Velez, and Swan (2006) stressed that “agricultural businesses, commodity organizations, non-profit groups, and government agencies need competent leaders who will provide direction and vision for the future of the agricultural industry (p. 94). The National Academies’ 2009 Transforming Agricultural Education for a Changing World Report in Brief highlighted, “This agricultural workforce must constantly respond to changes in the physical, economic, and social environment surrounding agriculture” (p.1), and that “academic institutions with programs in agriculture are in a perfect position to foster the next generation of leaders and professionals needed to address these challenges” (p.1). Course development within colleges of agriculture reflects the realization of leadership as an important skill for undergraduate students (Park & Dyer, 2005). Allen, Ricketts, and Priest (2007) noted, “There is a need for strong leaders in the agricultural industry, and organizations are looking for college of agriculture graduates who demonstrate strong leadership abilities” (p. 56). Therefore, colleges of agriculture should “position themselves at the cutting-edge and offer students the opportunity to learn about the complexities of agriculture, grapple with its emerging challenges, and find their opportunity to contribute as leaders and participants” (The National Academies, 2009, p. 1). Considerable ground has been made in colleges of agriculture to develop leadership courses and programs; however, continued assessment and development of courses must occur to maintain content reflective of prior student experiences and industry needs for graduates (Park & Dyer, 2005; Engbers, 2006; Ewing, Bruce, & Ricketts, 2009; Dugan & Komives, 2007). This transformation and adaptation will take time, but it must begin now in order to reflect the needs of the agricultural industry and engage students entering colleges of agriculture from the first day they step on campuses.

Theoretical Framework

The theoretical frame employed within this study is founded upon Astin’s Input-Environment-Output (I-E-O) model of student learning (Astin, 1993), in which students enter the college environment with certain personal characteristics and past experiences. While there, they interact with the college environment, and the combination of inputs and the environments lead to certain outcomes. This frame was designed to measure the varying effects of involvement and positional leadership within student organizations, as well as participation in structured leadership trainings, on leadership-related outcomes while adjusting for personal differences and pre-college experiences in students. Within this study, a framework of leadership was used that is described as “a purposeful, collaborative, values-based process that results in positive social change” (Komives & Wagner, 2009, p. xii) and serves as the definition of leadership within the Social Change Model of Leadership Development (Higher Education Research Institute, 1996), an increasingly popular model of leadership taught on college campuses. This style of leadership has been described as “post-industrial” in nature (Faris & Outcalt, 2001; Kezar, Carducci, & Contreras-McGavin, 2006; Rost, 1993) in that its less hierarchical nature emphasizes personal self-knowledge and values, collaboration and social skills, and positive
social change. This can be contrasted with what has been described as “industrial” leadership, in which control, uniformity, and supervision is stressed (Faris & Outcalt, 2001).

The Social Change Model (SCM) posits that emerging college student leaders should demonstrate capacity to lead in three separate areas: an individual domain, in which they are conscious of their values and personal attributes, and exercise these attributes consciously; a group domain, in which they collaborate gracefully with others and help their groups reach common purpose; and community domain, in which they lead to create positive social change (Astin, 1996; Higher Education Research Institute, 1996). The SCM served as the model of leadership utilized within this study.

**Purpose of the Study**

The purpose of this study was to explore differences in involvement and leadership capacities between a group of students who identify “agriculture” as their primary major and a comparison group of students who did not identify agriculture as their primary major. Given our theoretical frame, our research questions were:

1. Do agriculture students differ from non-agriculture students with regards to personal characteristics such as race, gender, and political orientation, and if so, to what extent is the difference?
2. Do agriculture students differ from non-agriculture students in the degree of involvement they report in both high school and college involvement and leadership opportunities, and if so, to what extent is the difference?
3. Lastly, do agriculture students differ from non-agriculture students in scores of leadership capacity and efficacy, and in scores of related measures such as cognitive complexity, social change behaviors, and the degree to which they participate in socio-cultural discussion with peers? If there are differences, to what extent?

**Methods**

**Population**

This study used data collected in the spring of 2009 as part of the Multi-Institutional Study of Leadership, which included a total of 55 colleges and universities that were selected from a sample of over 150 that had responded to a call for participation (Dugan & Komives, 2010) and were included due to their diversity in Carnegie classifications, selectivity, geography, size, control, and populations of students served. From these institutions, 155,716 students were invited to participate, and 56,854 completed surveys, for a 37% response rate (Dugan & Komives, 2010).

**Data Collection and Sample**

All data collection was conducted during the spring 2009 semester through emails sent with links to the online survey. Simple random samples of students were invited at institutions with undergraduate enrollments greater than 4,000. For smaller institutions, their entire undergraduate population was invited. Students received an email invitation and up to three reminders.

An item on the MSL invited students to identify their “primary major” from a list of 21 options, of which an option was “Agriculture.” A total of 461 students (0.5%) selected this option – this collection of students served as the sample of interest within this study. A total of 262 (57%) identified as female, 401 (87%) as Caucasian/White, 7 (2%) as African-American/Black, 14 (3%) as Asian-American or with Asian descent, 13 (3%) as Latino/Hispanic, while 26 (5%) either identified as multi-racial or did not identify. A comparison sample should optimally be of similar size and variability to the sample of interest (Miles & Shevlin, 2004), so rather than compare the Agriculture students to the remainder of the national sample of non-Agriculture students, a simple random sample (n=461) was selected from within this group to meet the requirement of homogeneity of variance in outcome variables across both samples. Within the comparison sample, 299 (65%) identified as female, while 341 (74%)
identified as Caucasian/White, 26 (5%) as African-American/Black, 35 (8%) as Asian-American/Asian, and 19 (4%) as Latino/Hispanic, while 40 (8%) identified as multi-racial or did not identify. The gender and racial demographics for the comparison group were not statistically different from the overall profile of the national sample.

**Instrumentation and Variables**

The MSL was designed to reflect Astin’s (1993, 1999) I-E-O model. Therefore, students were invited to respond to items regarding their personal and pre-college characteristics (Inputs), as well as their current involvements while in college (Environment). Outcomes were measured using a number of scales associated with leadership development.

**Input and Environmental Variables**

Students were asked to report their gender, race, and political orientation (a five-point scale from “very liberal” to “very conservative”). Demographic information regarding gender and race for the two samples were described earlier in the previous section. With regard to political orientation, 35% of the group of Agriculture students reported themselves as “conservative” and 11% as “very conservative,” compared to 17% and 5%, respectively, within the peer group. Approximately 16% identified as “liberal” and 6% as “very liberal” compared to 32% and 10%, respectively, within the peer group. Approximately 32% of the agriculture students reported themselves as “moderate” compared to 36% of their comparison peers.

Students were also asked to report their remembered level of involvement in and leadership of student groups in high school (“HS Involvement” and “HS Leadership,” respectively). HS Involvement was measured by a scale with a range of 4 – 16, incorporating four items focusing on governance organizations, spirit groups, performing arts organizations, and academic clubs, respectively. Students were then asked to rate their remembered leadership capacities while in high school, using a condensed version of the Socially Responsible Leadership Scale (“SRLS Pre-test”), which will be described later. Using a “recollection proxy pre-test design,” where students evaluate their remembered competencies from periods in their past, is not necessarily a valid measure of competency at the time students were asked to recall. However, it can serve as a valid means of measuring students’ perceived growth in the area of interest, especially when students are asked to rate their current competencies using the same measure (Trochim, 2006). The SRLS Pre-test included nine items, with scores ranging from 1 -5. In addition, students were asked to report the current extent of their involvement in and leadership of student organizations in college. Lastly, students were invited to share the extent of their participation in leadership development training programs while in college (“COL Lead Training”), including both curricular (e.g. a leadership class) and co-curricular (e.g. a retreat or conference). Involvement and leadership in high school and college organizations were measured on four-point scales ranging from “never” to “very often,” while participation in leadership trainings was measured on a five-point scale ranging from “never” to “much of the time.”

**Outcome Variables**

The Socially Responsible Leadership Scale (SRLS) was utilized as the outcome variable measuring leadership capacity within the theoretical frame of the SCM. It has been shown to possess acceptable levels of reliability and validity (Dugan & Komives, 2007; Dugan & Komives, 2010; Slack, 2006). Also included was a scale of Leadership Self-Efficacy (LSE), designed using Bandura’s model of self-efficacy (Bandura, 1997) to measure one’s confidence in leading others. Scales measuring indirect leadership capacity contained within the MSL included measures of Cognitive Complexity (“CC,” measuring the degree that students report growth in critical thinking skills), Social Change Behaviors (“SCB,” measuring the degree to which students engage in community-minded change actions), and Socio-Cultural Discussions (“SCD,” measuring the degree to which students engage in discussion with peers around topics of personal and societal differences). Each of these
scales were borrowed from the long-standing National Survey of Living Learning Programs (Inkelas, 2004; Inkelas, Vogt, Longerbeam, Owen, & Johnson, 2006). A sample item from the Cognitive Complexity scale is, “To what extent have you grown while in college in your ability to critically analyze ideas and information?” A sample item from the Social Change Behaviors scale is, “How often have you been actively involved with an organization that addresses a social or environmental problem?” A sample item from the Socio-Cultural Discussions scale is, “How often have you discussed major social issues such as peace, human rights, and justice?” All scale items other than the LSE ranged from 1 to 5, while the LSE ranged from 1 to 4. A summary of significant variables in this study can be found in Table 1.

Table 1  
Variables Examined Within This Study Collected as Part of the Multi-Institutional Study of Leadership  
<table>
<thead>
<tr>
<th>Input Variables</th>
<th>Environmental Variables</th>
<th>Outcome Variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>COL Involvement</td>
<td>Leadership capacity (SRLS)</td>
</tr>
<tr>
<td>Race</td>
<td>COL Leadership</td>
<td>Leadership Self-Efficacy (LSE)</td>
</tr>
<tr>
<td>Political orientation</td>
<td>COL Lead Training</td>
<td>Cognitive Complexity (CC)</td>
</tr>
<tr>
<td>HS Involvement</td>
<td></td>
<td>Social Change Behaviors (SCB)</td>
</tr>
<tr>
<td>HS Leadership</td>
<td></td>
<td>Socio-cultural Discussions (SCD)</td>
</tr>
<tr>
<td>SRLS Pre-test</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Data Analysis**

This research was designed to investigate differences between students who report “Agriculture” as their primary major and those that do not. To compare the personal demographic data for the Agriculture students with the comparison sample, chi-square analyses were conducted for each variable. To determine the size of effect for each finding of statistical significance, Cramer’s phi was calculated (Ellis, 2010). To examine potential differences between the two groups with respect to the chosen environmental and outcome variables, T-tests were conducted, while Cohen’s d (Hinkle, Wiersma, & Jurs, 2002) was calculated to determine the effect size of significant findings.

**Results**

Means and standard deviations for each scale variable were examined, and are included in Table 2. In general, Agriculture students’ scores were higher on measures of involvement compared to the random sample, and were lower on outcome measures of leadership capacity and related competencies.
Table 2
Means and Standard Deviations for Scaled Input, Environmental, and Outcome Variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Agriculture Students (n=461)</th>
<th>Comparison Group (n=461)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>μ</td>
<td>SD</td>
</tr>
<tr>
<td><strong>INPUTS</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HS involvement</td>
<td>11.54</td>
<td>3.61</td>
</tr>
<tr>
<td>HS leadership</td>
<td>2.85</td>
<td>1.22</td>
</tr>
<tr>
<td>SRLS Pre-test</td>
<td>3.87</td>
<td>0.55</td>
</tr>
<tr>
<td><strong>ENVIRONMENT</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>COL Involvement</td>
<td>3.41</td>
<td>1.41</td>
</tr>
<tr>
<td>COL Leadership</td>
<td>2.27</td>
<td>1.51</td>
</tr>
<tr>
<td>COL Lead Training</td>
<td>1.64</td>
<td>0.48</td>
</tr>
<tr>
<td><strong>OUTCOMES</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SRLS</td>
<td>3.87</td>
<td>0.52</td>
</tr>
<tr>
<td>LSE</td>
<td>3.05</td>
<td>0.67</td>
</tr>
<tr>
<td>CC</td>
<td>2.98</td>
<td>0.52</td>
</tr>
<tr>
<td>SCB</td>
<td>2.45</td>
<td>0.70</td>
</tr>
<tr>
<td>SCD</td>
<td>2.81</td>
<td>0.81</td>
</tr>
</tbody>
</table>

To determine if statistically significant differences existed between the two samples with regard to gender, race, and political orientation, a chi-square analysis was conducted for each variable. Cramer’s phi was calculated to determine the effect size of any significant differences (p < .05). A significant difference with a small effect was found with regard to gender ($\chi^2 (2, N=922) = 7.85, p = .02, \phi = .09$). Significant differences with moderate effects were found for race ($\chi^2 (25, N=922) = 48.91, p = .003, \phi = .23$), and political orientation ($\chi^2 (4, N = 920) = 71.20, p < .0001, \phi = .28$). An interpretation of these results is that the sample of Agriculture students contained more male students, more Caucasian students, and more students who identified as “conservative” or “very conservative” than the random sample of college students used as a comparison. No significant differences were found with respect to SRLS Pre-test score, t(920) = 0.83, p = .40.

The degree to which students reported being involved in and leaders of high school organizations was analyzed using T-tests. Students across the two samples did not differ in the degree to which they were involved in high school student organizations, t(920) = -.4, p = .67; nor in the degree to which they reported occupying positions of leadership within these organizations, t(920) = -1.20, p = .23.

The Environmental variables examined in this study were students’ reported involvement in and leadership of student organization, as well as the extent to which they participated in leadership training programs. T-tests were calculated, while Cohen’s d was examined if significant differences were found (p < .05). Agriculture students reported being more involved in college organizations than their non-Agriculture peers, t(919) = -2.94, p = .003; with a small effect size (d = .11). Moreover, they held leadership positions within these organizations to a greater extent, t(920) = 2.76, p = .006, with a small effect size (d = .09). However, agriculture students participated in leadership training events at marginally the same rate as their peers, t(920) = -1.82, p = .07.

Outcome variables for this study were leadership capacity measured through SRLS score, leadership self-efficacy (LSE score), and scores from measures of cognitive complexity, social change behaviors, and socio-cultural discussion participation. T-tests were conducted, while Cohen’s d was calculated if significant differences were found. Agriculture students’ SRLS scores of leadership capacity were lower, t(920) = 3.07, p = 002; with a small-to-moderate effect size (d = 19). Agriculture students did not differ from the comparison sample with regard to LSE score, t(920) = 0.89,
p = .23; nor did they differ on a measure of social change behaviors, t(918) = 1.07, p = .28. However, significant differences were found in measures of cognitive complexity, t(920) = 2.89, p = .004; and socio-cultural discussions, t(920) = 4.57, p < .0001. Small-to-moderate effect sizes were observed with regard to cognitive complexity (d = .18) while moderate effects were seen in socio-cultural discussion scores (d = 0.29). A summary of findings can be found in Table 3.

Table 3
Summary of findings: A Comparison of Agricultural Students with Comparison Group

<table>
<thead>
<tr>
<th>Variable</th>
<th>p Value</th>
<th>Effect Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>.02</td>
<td>.09</td>
</tr>
<tr>
<td>Race</td>
<td>.003</td>
<td>.23</td>
</tr>
<tr>
<td>Political orientation</td>
<td>&lt;.0001</td>
<td>.28</td>
</tr>
<tr>
<td>High school involvement</td>
<td>.67</td>
<td></td>
</tr>
<tr>
<td>High school leadership</td>
<td>.23</td>
<td></td>
</tr>
<tr>
<td>College involvement</td>
<td>.003</td>
<td>.11</td>
</tr>
<tr>
<td>College leadership</td>
<td>.006</td>
<td>.09</td>
</tr>
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Note: significant differences (p < .05) in bold

Discussion

The results revealed that the group of students who reported “Agriculture” as their primary major included slightly more males, was moderately less racially diverse, and reported as moderately more politically conservative than a comparison group of students from the same institutions. Agriculture students and their comparison peers were involved in and led student organizations to similar degrees while in high school. While in college, agriculture students reported slightly higher degrees of involvement with college organizations, and held slightly more leadership positions within them, than the comparison group. However, they did not participate in leadership training events on campus to a greater degree. Perhaps most noteworthy for a study of student leadership outcomes, agriculture students displayed moderately lower levels of leadership capacities in college – while not significantly differing on a “recollection pre-test” of the same capacities in high school. In addition, agriculture students scored moderately lower on a measure of cognitive complexity and engaged moderately less in socio-cultural discussions with peers when compared to the randomized group of students. The largest differences, measured by effect size, between the two groups were students’ political orientation and the degree of engagement in socio-cultural discussions with peers. No differences were found between the groups on measures of leadership self-efficacy and the degree to which students engaged in social-change behaviors such as political activism or community organizing.

Several studies in the past have shown the positive effects of involvement in student organizations on a variety of outcomes, including leadership development (Astin, 1999; Foubert & Grainger, 2006; Kuh, 1995). These findings suggest that involvement in these organizations may be more nuanced than originally considered, given that agriculture students displayed higher degrees of involvement and less leadership capacity.

Recent prior studies of student leadership capacity have shown that the degree to which
students engage in socio-cultural discussions with peers – that is, how often they discuss issues of personal and social importance or issues in which they differ from others – is an important predictor of the types of post-industrial leadership capacities relevant for professional success in the Twenty-first Century (Dugan & Komives, 2007, 2010). The results of this study show that students primarily situated within the field of agriculture engaged in these discussions less often than their peers, and that the extent of the gap may be potentially large. In addition, agriculture students displayed a small-to-moderate difference in scoring lower on a test of self-perceived cognitive complexity – that is, the degree to which they reported feeling effective in connecting divergent information and engaging in areas in which they knew little but would like to learn more.

Implications

These findings suggest that the act of engaging with peers in an organization, when controlling for other personal and environmental factors, may not be as significant a predictor of leadership development as previously thought. The degree to which students authentically engage with their peers and connect with them around discussions of personal significance may serve as the significant predictor when studying factors within student involvement that lead to increased leadership capacity. As the results are based on a nationally representative sample of students, the findings in this study have important implications for agricultural classroom instructors and advisors of individual students and agriculture-based student organizations.

Those who serve as course instructors might increase both student cognitive complexity and leadership capacity by incorporating important social issues into their classrooms and curriculum, while allowing, expecting, and encouraging dissenting viewpoints from students who engage in the discussion. While these findings suggest that agriculture students may be more homogenous than a random sample, this does not imply strict homogeneity. For example, 22% of agriculture students self-report as “liberal” or “very liberal.” Allowing for differing perspectives and dissenting viewpoints may yield critical discussion that builds cognitive growth and leadership development opportunities in agriculture-oriented classrooms.

In the same way, advisors to students might provide more encouragement or opportunity for deep and meaningful dialogue amongst peers. Both authors have served in advisory roles to student organizations in the past, and know the pressure that students may feel at times to “get through the agenda.” Such meetings may provide a satisfactory level of task productivity yet not build the type of social atmosphere necessary for authentic engagement in a peer setting (Levi, 2011). Moreover, it may leave students without the opportunity to practice the skills they will need to collaborate with or supervise diverse others in less-structured environments.

Suggestions for Future Research

While recent studies have shown the correlation between socio-cultural discussion and leadership capacity (Dugan & Komives, 2007; Dugan & Komives, 2010), more research must be conducted to examine the relationship between these two constructs, especially in an agriculture-oriented context like Collegiate FFA organizations. For example, how might the participation in socio-cultural discussions lead a student to report higher levels of leadership capacity while not resulting in an increased score for leadership self-efficacy? In what ways does participation in these discussions lead to the ability to collaborate more effectively, or possess a greater capacity to lead a group within the context of a larger organization? Anecdotal evidence may exist, but so far little research has been conducted examining this relationship. In addition, the second-largest difference between the two groups was found in political orientation. More research could be conducted examining the potential mediating or moderating role that political orientation may play in engaging in socio-cultural discussions. Again, anecdotal evidence may exist, but no rigorous research has been conducting examining the two constructs.

Another line of potential research regards the study of agriculturally-based student...
organizations. Many of these organizations are some of the oldest organizations on the college campus and exist on the high school level as well. They have been studied extensively in the past with regard to their effect on student leadership development (Anderson, Bruce, & Mouton, 2012; Ball, Garton, & Dyer, 2001; Connors & Swan, 2006; Hastings, Barrett, Barbuto, & Bell, 2011; Park & Dyer, 2010). However, surprisingly little research has been conducted with regard to students’ experiences in collegiate agricultural organizations (i.e. CFFA, 4-H, PAS, etc.) or the discipline-based organizations popular in many colleges of agriculture. What themes exist regarding their organizational structures, especially as they may differ from other non-agricultural organizations? How do students interact, set strategic priorities, accomplish goals, and select peers for leadership positions within them, especially compared to other student organizations not affiliated with the field of agriculture?

Another potential direction for research is the degree to which socio-cultural discussion matters to the development of students relates to the internationalization of the agricultural curriculum. Internationalization has been a strong area of emphasis in the past in agricultural education and continues to be a priority area for colleges of agriculture across the nation. *The National Strategic Plan and Action Agenda for Agricultural Education* outlines a vision where, “all people value and understand the vital role of agriculture, food, fiber and natural resources systems in advancing personal and global well-being,” with the mission of agricultural education reflecting the preparation of students for that vision (National Council for Agricultural Education, 2000, p. 3). The National Academies (2009) includes this area among their steps for enabling education programs to meet industry expectations, recommending “institutions should increase students’ exposure to international perspectives by supporting targeted learning-abroad programs and by incorporating international perspectives into existing courses” (p.2). Additional research is needed to determine if such experiences and cultural awareness at secondary and post-secondary levels may enhance the leadership capacity of agricultural students to engage in socio-cultural discussions.

Finally, the use of mutually beneficial community organization partnerships should be explored for various colleges of agriculture courses. Strategic partnerships offer students professional experience while making a stronger connection point for community organizations and corporations to communicate needs and expectations for future employees (The National Academies, 2009). Such relationships could offer students the opportunity develop deeper levels of cognitive complexity by promoting agricultural awareness while engaging in rich, socio-cultural experiences with reflection and discussion elements incorporated into the course work.

### Conclusion

This study highlighted that agricultural students maintain a strong level of involvement in leadership development throughout their high school and collegiate experience; however, such involvement may not necessarily lead to growth in leadership capacity in comparison to non-agricultural students. These findings may be related to deficits seen in agriculture students’ self-reported cognitive capacity and participation in socio-cultural discussions. Our results of this study imply that agricultural educators may benefit their students in providing and designing opportunities for leadership development that include experiences with socio-cultural contexts and reflection. This is reflective of Freeman and Goldin’s (2008) findings that leadership programs with intentional design offer students practical experiences to better their leadership capacities for current and future application.

It is clear that change is needed in higher education programs to reflect the expectations of the agricultural industry and growing interdisciplinary collaborations in our global society. The National Academies (2009) emphasizes, “If institutions of higher learning do not address the changes needed, they risk becoming irrelevant. Without significant action, graduates of these programs will have difficulty keeping up with the changing needs of society and building stable careers, and the nation will
miss its opportunity for leadership in addressing the global challenges related to food and agriculture” (p. 2). Although involvement in leadership development at the secondary level may indicate active student involvement in collegiate organizations and in future professional opportunities (Allen, Ricketts, & Priest, 2007), further emphasis is needed in leadership development within agricultural classrooms for the agricultural industry to have sustainable leadership for years to come.

References


DAVID M. ROSCH is an Assistant Professor of Leadership Studies in the Agricultural Education Program at the University of Illinois at Urbana-Champaign, 137 Bevier Hall, Urbana, IL 61801, dmrosch@illinois.edu.

NATALIE COERS is a Program Coordinator for the College of Agricultural and Life Sciences Teaching Resource Center and Leadership Institute at the University of Florida, 2002 McCarty Hall D, Gainesville, FL 32611, ncoers@ufl.edu.
Teacher Behaviors Contributing to Student Content Engagement: A Socially Constructed Consensus of Undergraduate Students in a College of Agriculture

Christopher M. Estepp
Sul Ross State University
T. Grady Roberts
University of Florida

Students in colleges of agriculture will face a dynamically changing workplace. In order to learn the skills needed to succeed in such an environment, students must be cognitively engaged in the college classroom. Engagement with instructional content is a precursor to learning, and teachers in colleges of agriculture must shift towards using more learner-centered, engaging instructional methods. The purpose of this qualitative study was to explore college of agriculture students’ perspectives of specific teacher behaviors contributing to cognitive engagement. A focus group methodology was applied using the Student Content Engagement (SCE) framework to guide the interviews. The SCE framework consists of four constructs that must be in place for cognitive engagement to occur: subject matter content level, occasion for processing, physiological readiness, and motivation. Results of the study showed a multitude of teacher variables contributed to student content engagement and many of the findings were consistent with prior research about effective teaching. What is more, teacher immediacy was discovered as a consistent theme throughout all of the constructs. We concluded that teacher immediacy might be a construct for consideration in the SCE framework.

Keywords: agricultural education; college of agriculture; student engagement; teacher behaviors

In light of changing technologies and rapid globalization, employers expect college graduates to have an extensive skill set, including problem-solving, critical thinking, conflict resolution, and leadership, along with many other higher-order thinking skills (Arum & Roksa, 2011; Association of Public and Land-grant Universities, 2009; National Research Council, NRC, 2009). What is more, the National Research Council argued that employers in the agricultural industry are looking for these skills coupled with an appreciation of agriculture. Accordingly, learning environments in colleges of agriculture are the starting place to prepare graduates for this dynamic workplace. To adequately equip students, effective instruction should provide educational experiences that actively engage students with the content being taught (McLaughlin et al., 2005). The need for active, engaging instruction has been recognized in higher education (Bonwell & Eison, 1991; Braxton, 2006; Svinicki & McKeachie, 2011) and colleges of agriculture (APLU, 2009; NRC, 2009). Consequently, the implementation of more engaging instruction in colleges of agriculture might aid in supplying the workforce with competent, resourceful graduates capable of meeting employers’ needs.

The term student engagement has been widely used in higher education. However, much of the research conducted concerning student engagement has investigated the involvement of students in all aspects of college life (National Survey of Student Engagement, NSSE, 2000). Kuh, Kinzie, Buckley, Bridges & Hayek (2006) proposed that student engagement lies at the intersection of student behaviors and institutional factors and that high levels of student engagement are facilitated by many educational influences, including active and
collaborative learning, faculty-student interactions, and educational environments that are inclusive and affirming with high, clearly communicated expectations for success. Because the learning environment plays a huge role in student engagement, we took a narrower focus on student engagement by examining student cognitive engagement in the learning process.

For this study, cognitive engagement was operationally defined as a psychological investment in learning by students, characterized by cognitive processes including increased mental effort, active attending to, and interaction with the material to be learned (Fredricks, Blumenfeld, & Paris, 2004; McLaughlin et al., 2005; Weinstein & Mayer, 1986). McLaughlin et al. (2005) termed this student content engagement and stated that this is not an assurance of learning, but must be present for learning to take place.

The Student Content Engagement (SCE) model proposed by McLaughlin et al. (2005) served as the frame for this study. The SCE model was chosen for several reasons. First, McLaughlin et al.’s definition of engagement closely aligned with ours. Next, the SCE model deals strictly with the engagement that occurs in the learning environment, and lastly, the constructs of the SCE model encompass an assortment of student and teacher variables, both visible and latent. The four constructs of the model include: (a) subject matter content level, (b) occasion for processing, (c) physiological readiness, and (d) motivation, all of which McLaughlin et al. posited must exist for cognitive engagement to occur.

Smith, Sheppard, Johnson and Johnson (2005) indicated that the primary objective of teachers should be to engage students with the content. To accomplish this, McLaughlin et al. (2005) posited that teachers’ instructional designs and teaching behaviors should incorporate aspects of the four SCE constructs. This qualitative inquiry seeks to build upon the SCE model by investigating specific teacher behaviors that contribute to increased student content engagement.

Subject Matter Content Level

The first construct of the SCE model is Subject Matter Content Level (SMCL). The main premises of the SMCL construct are that first, all new learning is dependent upon a learner’s prior knowledge and second, new knowledge should be introduced to learners at a level just above what learners already know (McLaughlin et al., 2005).

In line with the first premise of SMCL, Piaget and Inhelder (1969) theorized learners’ experiences and prior knowledge help them develop perceptions of the world around them, which they use to make sense of their surroundings. Dewey (1938) suggested that all students enter the classroom with prior knowledge and experiences while Doolittle and Camp (1999) added that learners use this prior knowledge to help interpret new information. In a study of undergraduate agriculture students at the University of Nebraska, Mousel, Moser, and Schacht (2006) discovered that students lacking agricultural background knowledge performed poorer in an introductory agriculture class than students with agricultural background knowledge. In a similar study of undergraduate agriculture students, Greene and Byler (2004) found that students’ agricultural background and whether or not students took high school agricultural classes served as slight predictors of performance in several undergraduate introductory agriculture classes. Results of these studies add evidence to the belief that student background knowledge plays a role in the acquisition of new knowledge.

The second premise of SMCL was that new information should be presented to learners at an appropriate level for learning to occur. Vygotsky (1978) proposed the zone of proximal development, which specified that if students are posed with a task they deem too difficult or too easy, students either give up or choose not to complete the task. Therefore, according to Vygotsky’s recommendations, learning tasks should be at a level that challenges the student but not to the point of being overly difficult. In agriculture, there is a lack of research on the level of difficulty of learning activities relating to cognitive engagement, as defined in this study. However, Whittington and colleagues
(McCormick & Whittington, 2000; Whittington, 1995; Whittington & Newcomb, 1992) have extensively studied cognitive levels of instruction in college of agriculture classrooms as a way to increase critical thinking. McCormick and Whittington (2000) measured the cognitive level of academic challenges of eleven professors in the College of Agricultural Sciences at Penn State University. They found across the different academic challenges (e.g. exams, projects, and problem sets) varying levels of cognition were reached, with exams mostly exhibiting lower levels of cognition while projects and problem sets employed higher levels of cognition. Recommendations by McCormick and Whittington were that professors should deliberately plan activities requiring students to think at higher cognitive levels. A similar study by Newcomb and Trefz (1987), found that 85% of the items on in-class and out-of-class assignments in 16 classes in the College of Agriculture at The Ohio State University required students to think at low cognitive levels. This appears to be an issue throughout colleges of agriculture, as Whittington (1995) revealed, professors in colleges of agriculture desire to teach at higher cognitive levels, but in reality, professors tend to teach at lower cognitive levels.

Occasion for Processing

The second construct proposed by McLaughlin et al. (2005) is Occasion for Processing (OP). OP concerns the learning activities which allow students opportunities for cognitive processing, defined earlier as cognitive engagement. McLaughlin et al. stated OP does not deal with the processing itself, as processing is internal and not readily seen or easily measured. Instead, OP deals with the opportunities students are given to engage in learning activities.

The selection of suitable instructional methods and activities provides the occasion for processing to students. Research by Rosenshine and Furst (1971) revealed that one characteristic of effective teachers is the ability to utilize multiple, varied learning activities, while Hativa (2000) argued mental engagement in these activities leads to student learning. Consequently, Dyer and Osborne (1996) recommended that teachers select and utilize appropriate teaching methods to help ensure the success of students’ learning.

Active learning strategies are an excellent approach to provide the occasion for processing. Svinicki and McKeachie (2011) advocated the use of active learning strategies in the college classroom, which engage students through different modalities and lead students to higher levels of cognitive thinking. Supporting this idea, Murano and Knight (1999) reported the results of a study, in which students in an introductory food science course were assigned a cooperative learning term project, the purpose of which was to strengthen the communication, higher-order thinking, and creativity skills of the students. Results revealed that students were generally pleased with the experience and indicated gains in their comprehension of the material. In addition, students reported that they were actively engaged with the project and utilized higher level cognitive skills to solve the problems. Many faculty members in colleges of agriculture understand the importance of occasion for processing. Harder, Roberts, Stedman, Thoron, and Myers (2009) surveyed instructors in the College of Agricultural and Life Sciences at the University of Florida concerning teaching competencies, and found that instructors identified engaging students, using active learning strategies, and teaching critical thinking as some of the most relevant teaching competencies.

Physiological Readiness

Physiological readiness (PR) addresses the biological requirements for learning, which McLaughlin et al. (2005) deemed an “important precursor to engagement” (p. 13). Maslow (1943) argued that physiological needs must be met before higher levels of needs can be considered. McLaughlin et al. described five main areas of PR: attention, stress, disabilities, nutrition, and sleep. There is a dearth of research in agricultural education at the postsecondary level concerning physiological readiness factors. However, research has been conducted in education concerning the effects of physiological needs on learning. Studies indicated that
stress (Cohen, Evans, Krantz, & Stokols, 1986), nutrition (Smith, Kendrick, Maben, & Salmon, 1994), and sleep (Pilcher & Walters, 1997) all have an effect on the cognitive functions of students.

**Motivation**

Many motivational theories exist; however the theory used in the SCE model is the expectancy-value theory of achievement motivation (EVT) (Wigfield & Eccles, 2000). EVT deals with a person’s expectations for success and their perceived value of a task (Wigfield & Eccles, 2000). Students’ expectancies and their value beliefs play a role in the amount of effort they will put forth in the classroom (Velez & Cano, 2008). Pintrich and Schunk (2002) concluded people tend to try harder, persist, and perform better when they expect to do well, while Weiner (1992) suggested students will engage in behaviors consistent with attaining a goal when they see value in reaching that goal. Accordingly, how a student perceives their abilities coupled with the value they place in a course should have an effect on their motivation to engage in classroom tasks. Velez and Cano suggested that teachers should understand and utilize behaviors that lead to increased student motivation.

**Purpose**

The National Research Agenda has identified meaningful, engaged learning in all environments as a priority (Doerfert, 2011). Consequently, this study of student content engagement should help add insight into this area. The SCE model provides a good framework to study cognitive engagement; however, the SCE model is relatively new, untested, and theoretical in nature and does not provide instructors with practical suggestions for use in the learning environment. This study seeks to identify teacher behaviors that contribute to student engagement with the intent of filling gaps in the model allowing it to be used more pragmatically in the classroom or laboratory. We used the constructs of the SCE model to guide the question development for the focus groups, thus creating a framework upon which students’ discussions were built. Accordingly, the purpose of this qualitative study was to explore the socially constructed perspective of students in a college of agriculture concerning specific teacher behaviors contributing to cognitive engagement using the SCE model as a guide.

**Methods**

The theoretical perspective for this study was social constructivism. Social constructivism is the belief that knowledge is constructed through social interactions (Flick, 2006). Crotty (1998) stated knowledge is “constructed in and out of interaction between human beings and their world, and developed and transmitted within an essentially social context” (p. 42). In the case of this study, the constructed knowledge of interest was the teacher behaviors that groups of students collectively felt led to cognitive engagement. Because the intent of this study was to examine students’ perceptions of their teachers’ actions, we believed the purpose of this study was best accomplished through the lens of social constructivism. A qualitative methodology that included three focus groups was used in this study. According to Flick (2006), focus groups can be viewed “as a quasi-naturalistic method for studying the generation of social representations or social knowledge in general” (p. 199). As a result, focus groups were deemed an appropriate method for use with a social constructivist theoretical perspective.

Participants for the study were recruited from a large technical writing course in the College of Agricultural and Life Sciences during the spring 2010 semester at the University of Florida. This course was chosen because a wide range of students from a variety of agricultural majors enroll in the course, and students are required to be juniors or seniors. Our belief was that juniors and seniors would have a larger base of classroom experiences to draw upon than younger students, thus generating richer discussions in the groups. To prevent any bias, we had no affiliation with this class. We were allowed to discuss the project at a class session and invite students to participate, and participants were offered an incentive of extra credit points in the class for participating in the study. A total of 29 students volunteered to participate, and three
focus groups were conducted with 12, 12, and 5 participants. Students self-selected which focus groups they attended based on the available dates.

Interview guides were developed using semi-structured questions (Merriam, 1998). This allowed the focus group moderator to guide the discussion, while reacting to and exploring participant responses. Extensive discourse among participants was encouraged by the moderator throughout the focus group to increase the richness of the data. The four constructs of the SCE model (McLaughlin et al., 2005) guided the construction of the open-ended questions for the interview guides, but the four main constructs were not explicitly stated to the participants. Questions were worded in a way that allowed students to think of instructors from their previous courses. Examples of questions from the interview guide included, (1) in what ways have your instructors really made you think about a topic, (2) in what ways have your instructors gotten you back on track and ready to learn, and (3) what things have contributed to the amount of effort you put into a class?

To establish trustworthiness, each focus group was audio-recorded and then transcribed verbatim. Once the focus groups were transcribed, we listened to the recordings a second time to verify the accuracy of the transcriptions (Merriam, 1998). During analysis the primary researcher made the initial categorization of themes and the second researcher reviewed the analysis. We then discussed discrepancies and came to agreement on the categorizations (Merriam, 1998).

For the data analysis, the data were loaded into Weft QDA, which is a downloadable qualitative data analysis program that helps organize the data, and analyzed using a hybrid approach of qualitative methods. The deductive \textit{a priori} template of codes method delineated by Crabtree and Miller (1999) was used in conjunction with the constant-comparative method (Glaser & Strauss, 1967). Data were first analyzed using the constant-comparative method; responses were categorized and analyzed repeatedly to determine emerging themes. Because participants of the three focus groups were taken from the same class, no attempt was made to determine differences between the groups. Themes that emerged across groups were the themes that were reported. Once the emergent themes were identified, they were grouped and assigned labels. In conjunction with the template of codes method, the emergent themes were then compared to the constructs of the SCE model (McLaughlin et al., 2005) and emergent themes found to be congruent with the SCE constructs were organized under the applicable constructs, while newly emergent themes were presented as possible new constructs.

To comply with Institutional Review Board protocol, confidentiality of the participants was achieved by attributing data to the focus group not the individual participant. The codes for each group were: FG1=Focus Group 1; FG2=Focus Group 2; and FG3=Focus Group 3. In addition to ensuring participant confidentiality, this also helped create an audit trail. Quotes were traceable back to the raw data in Weft QDA using the focus group codes thus helping to ensure confirmability (Erlandson, Harris, Skipper & Allen, 1993).

When conducting a qualitative study, it is appropriate to present researcher biases to provide readers with a lens in which to interpret the results (Merriam, 1998). The primary researcher is a former high school teacher and current doctoral student studying agricultural education. The second researcher is a faculty member in agricultural education. We both believe in creating learner-centered instructional environments in which students are active participants in the learning process.

\section*{Results}

\subsection*{Subject Matter Content Level}

The first construct of the SCE model was subject matter content level. Emergent themes that fit under this construct were teacher elaboration, difficulty of classes, and student prior knowledge.

\textbf{Teacher elaboration.} Students agreed they were more likely to engage when teachers explained content in simple, understandable terms. As one student noted, teachers help him engage in the material when “they talk about it
in our language” (FG 1). Another student said, “If you can also take it and explain it on a level to where we know nothing… for me that helps” (FG 1). Instructional content presented clearly, at an understandable level helped students cognitively “solidify the concepts” (FG 2).

**Difficulty of classes.** Students described having higher levels of cognitive engagement in classes perceived as difficult. “If it’s difficult I would tend to try to keep up with the material a little more” (FG 1). Note-taking, questioning, and overall attention increased when the level of the content was more complicated (FG 1, 2, &3). One student noted, “You’re more…focused in a harder class” (FG 2).

**Student prior knowledge.** Students preferred teachers who take time to assess students’ prior knowledge and connect new information to that knowledge. According to the students, these connections take shape in the form of pre-tests, review questions, movie clips, problem sets, and discussions among others (FG 1, 2, &3). One student stated, “I took this pathogens class where we had a pre-test…and he just wanted to know what exactly we knew coming into the class…and then he kind of tailored his teaching to that” (FG 3). Another student said, “There are a lot of concepts that they [teachers] come in assuming you already know, so they’ll whiz through that material” (FG 3). “Sometimes they [teachers] assume that you know all these things” (FG 1).

**Occasion for Processing**

The second construct of the SCE model was occasion for processing. The emergent themes congruent with this construct were interest approach, daily class structure, discussion, projects, assessment, repetition, questioning, collaborative learning, variability in teaching, problem-based learning, and contextualizing the content with examples.

**Interest approach.** Students believed teachers who utilize an interest approach to begin class helps students get ready to engage. One student described an early morning class where the teacher would play music as everyone ar-

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**Teacher Behaviors Contributing…”**
student summarized, “I think class discussion is wonderful” (FG 3).

Projects. Most students felt projects were engaging. One student described a semester long project which required periodic class presentations by saying:

[Use of projects] really shows if you’re learning or not, because it shows, not only have you taken the time to go the extra mile and do whatever you can, but it also shows that you have learned the material and you can teach it to someone else. (FG 1)

The types of projects students said they benefited from most directly applied material from class and used knowledge built throughout the semester. These projects helped students stay engaged because students knew they would need to have a good understanding of the material to complete their projects.

Assessment. Students agreed the most common type of classroom assessment is the multiple choice exam. However, almost all students agreed the type of exam changes the way they engage in the material. Essay tests were regarded as the type of assessment that required the most studying and understanding of a topic (FG 2). However, alternative assessments also helped students cognitively engage and demonstrate the knowledge gained in a class. One student’s example of an alternative assessment was a class presentation: “I had a presentation as an exam grade…that makes you have to make sure that you can effectively teach the class that material too, so it makes you understand” (FG 2).

Repetition. Another aspect of occasion for processing which arose in the focus groups was repetition. Students agreed teachers who use repetition in their teaching help them engage more than teachers who do not use repetition. Some examples of repetitious teacher behaviors described by students were repeating information in class, referring back to material from previous classes, regular quizzes, and homework assignments. One student summarized by saying, “I would say the key is repetition” (FG 1).

Contextualizing the content with examples. Students overwhelmingly agreed that when teachers use examples in class they are more engaged. One student described a teacher who brought in visual aids:

[The teacher] brought in some spoiled goods and it’s stuff that, it’s whenever they go above and beyond and they make sure that you know, ‘I’m gonna reach everyone in the class even the person who’s asleep in the back by bringing in something interesting,’ then that definitely aids in the learning process. (FG 3)

Questioning. Another activity used by teachers which helped engage students was questioning. One student mentioned, “The teacher would call on students, so you are forced to pay attention” (FG 2). Another student declared questioning “does make you sit and think ‘ok, what did I just learn’” (FG 3). The majority of students said if they knew a teacher was prone to question students they would engage more in class.

Collaborative learning. Participants agreed in-class collaborative learning activities helped them engage in class. Students mostly mentioned collaborative learning activities such as group discussions, presentations, and role playing. The consensus among students was that in large or small classes their engagement was increased by group work. “I feel like when people are more engaged in like, group settings then yeah, people are more helpful and I just learn so much more” (FG 3).

Variability in teaching. Students were more engaged when teachers varied their teaching methods. Engaging teachers “won’t just teach something one way, a difficult thing one way, but instead will teach it in multiple fashions” (FG 3). Variability in teaching styles, assignments, classroom activities, and assessments were mentioned as key areas (FG 1, 2, & 3). One student also mentioned he enjoyed guest lecturers because it provided variety which helped him engage more (FG 3).
Problem-based learning. Several students explicitly mentioned problem-based learning as a way to keep students engaged in the material, help them to learn to think critically, and become independent learners. One student said, “It does really help you grasp the material for actually putting it into use while you’re learning” (FG 3). Another student indicated he was interested in medical schools that implemented problem-based learning. He said, “PBL kind of helps you...you know you become a better critical thinker because you have to figure out your own problem” (FG 3).

Physiological Readiness

The third construct was physiological readiness. Emergent themes under this construct included personal stressors, class stressors, and class time.

Personal stressors. Participants indicated that personal stressors lower classroom engagement. Some examples of personal stressors which surfaced were family problems, money issues, employment, and extracurricular activities (FG 1, 2, & 3). In regard to stress, one student stated “I would say I perform a lot more poorly or pay a lot less attention in class” (FG 2). Another student said, “It’s like hard for me to pay attention when I study because I got so much more stuff going through my mind so I feel like that has a really big effect on it” (FG 1). Additionally, one student indicated, “I can study and I do very well in school; but if, you know, something’s going on in my life and I’m just all emotional about that that will ruin everything” (FG 1). Students understand how stress affects their engagement and stated they like when teachers help them through stressful times. One student remarked, “It’s really nice and comforting when teachers and your TAs go above and beyond to help you get back on track” (FG 1).

Class stressors. The effect of classroom stress was the same as personal stress on student engagement, but students believe the teacher can be more help in this area. Most classroom stress mentioned dealt with tests and assignments. One student remarked, “All of a sudden it seems like everything comes due at once or you have tests at once” (FG 2). Other class stressors noted by students were teachers increasing the difficulty of classes, assigning large amounts of reading, and assigning coursework not on the syllabus.

Class time. Students indicated being less engaged in early morning classes. While discussing morning classes one student stated, “It’s a lot harder to learn” (FG 3). Another student described how a teacher helped students in this aspect was by scheduling exams in the evening. The student revealed this helped with studying for and engagement during the exam: I really like that he schedules his tests at night. That way you don’t have to be prepared to take it like super early in the morning. You just don’t have class in the morning and you take it later in the day. (FG 2)

Motivation

The last construct of the SCE model was motivation. The emergent themes under motivation included relevance, and class reputation.

Relevance. Teachers who connect classroom content with real world applications are more engaging to students. One student said, “If you just go to class and you don’t see the relevance of it, even if it is for a grade it’s going to be hard to engage” (FG 2). Another student stated, “Drawing a connection between what you’re learning and how it could actually apply…finding a way to make it practical I think really would be a good stimulus for students to engage mentally” (FG 2). Skills described by students as being real world were resume writing, interviewing techniques, team building, and critical thinking (FG 1, 2, & 3). One student summarized by asking, “If you’re learning about something that doesn’t have to do with the real world, why learn it” (FG 3)?

Class reputation. Students indicated that they draw upon a variety of resources to determine the reputation of a class. Sources range from peers, to ratemyprofessor.com, to the self-perceived difficulty of the subject. Class
reputation gives students a preconceived idea of the class and/or the teacher and affects student engagement. One student commented, “If I hear…there’s a class that’s difficult I think I would pay closer attention to what the professors are saying because…I won’t be able to do well on the exams if I don’t pay closer attention” (FG 3). Another student observed, “If I hear ahead of time that there’s a professor that’s really, really hard I know this, that I myself stay awake [sic]…whenever I hear that it’s difficult I try to pay closer attention and be more focused” (FG 3).

Teacher Immediacy

An emerging theme that surfaced was teacher immediacy. Students generally mentioned teacher immediacy while discussing motivation, however the theme ran through all of the SCE constructs. Because of this, teacher immediacy was presented as its own construct. The emergent themes grouped under teacher immediacy were personal connection, teacher caring, teacher effort, teacher enthusiasm, and teacher approachability.

Personal connection. Students indicated more of a desire to engage in classes where teachers exhibit a personal connection with students. Examples of personal connections included the use of personal stories in teaching, teachers learning students’ names, and teachers taking an interest in students’ personal lives and goals (FG 1, 2, & 3). The majority of the students said they would be more engaged in a class where teachers use personal examples. Personal stories “make you remember that your teachers are human; because sometimes teachers, you feel like they’re these people that you wonder, do you have a life beyond your subject” (FG 3). Students suggested personal stories helped them relate to their teachers better. Another personal connection factor which students said personalized their experience and made them want to engage more was when teachers learned students’ names. “I think any class where the teachers know your name you’re automatically more inclined to pay attention because you feel like they know, they’ll be watching out for you” (FG 3). The last personal connection was teachers taking an interest in students’ personal lives and goals. Describing one professor, a student said, “She knows all of our names she knows where we’re going, what we’re doing; she made it a point to get to know all of us” (FG 3). Students agreed personal connection to the teacher was a factor that helped them engage in class.

Teacher caring. Students identified teacher caring as an important element leading to student engagement. One student stated, “They [teachers] want you to succeed they don’t want you to walk away from it thinking that it was a waste of time, and if they make that clear to you then it makes you want to be better yourself” (FG 2). Another student agreed, “It makes you care more about the teacher if they care about you, and when you care more about the teacher you want to do good in the class for them” (FG 1). One student gave a specific example by stating:

I have a class…the teacher comes up and asks right before class ‘how are you doing’…and like shows an interest and that really helps. I mean it gets you ready for class and you feel like you want to learn…so many teachers could care less they just go up and start lecturing. (FG 1)

The participants felt a need to perform better when they thought the teacher cared about their learning.

Teacher enthusiasm. Additionally, students stated a preference for teachers who display enthusiasm in their teaching. “I remember [teacher] from biology, he was really energetic in how he taught it, and the whole time I was able to pay attention” (FG 3). Another student remarked, “When professors are passionate about it, I would be engaged and listening and learning the entire time…For me it makes a big difference, because I have seen the effects of passionate and not passionate teachers” (FG 1).

Teacher effort and teacher approachability.

Teacher effort and approachability were the last two teacher immediacy factors which surfaced during the focus groups. Students felt each of these teacher characteristics contributed
to student engagement in a positive way. In response to teacher effort one student said, “If I see a teacher putting a lot of effort into his class...I am going to want to work harder in return because I feel they’re putting their side of the effort in” (FG 2). Teacher approachability was considered crucial by students for classroom engagement. One student said, “If you’re approachable then the students are not going to be intimidated to learn, and they’re not going to be as scared to ask questions” (FG 3).

Conclusions/Recommendations

Results of this study revealed that within the SCE framework (McLaughlin et al., 2005) a multitude of observable, measurable teacher behaviors exist (See Table 1). The subject matter content level results were consistent with prior research. Students indicated they were more engaged when material was presented at challenging, yet understandable levels corresponding to Vygotsky’s (1978) work. In addition, students reported increases in engagement when teachers made an effort to assess prior knowledge and connect prior knowledge to information being taught, which is in accordance to the work of Dewey (1938) and Doolittle and Camp (1999).

A variety of behaviors contributing to student cognitive engagement surfaced within the occasion for processing construct. Student engagement was enhanced by instructors’ use of specific active learning activities such as discussions, projects, collaborative learning, and questioning. These findings were consistent with previous research on teaching and learning (Bonwell & Eison, 1991; Hativa, 2000; Smith, Sheppard, Johnson & Johnson, 2005). The use of varying instructional methods also contributed to students’ perceptions of their level of engagement. Rosenshine and Furst (1971) considered variability in instruction a characteristic of effective teachers. In addition, participants specifically mentioned problem-based learning as a teaching method that promotes cognitive engagement.

<table>
<thead>
<tr>
<th>Subject Matter Content Level</th>
<th>Occasion for Processing</th>
<th>Physiological Readiness</th>
<th>Motivation</th>
<th>Teacher Immediacy</th>
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</thead>
<tbody>
<tr>
<td>Teacher Elaboration</td>
<td>Interest Approach</td>
<td>Personal Stressors</td>
<td>Relevance</td>
<td>Personal Connection</td>
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<td>Class Difficulty</td>
<td>Daily Class Structure</td>
<td>Class Stressors</td>
<td>Class Relevance</td>
<td>Teacher Caring</td>
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<td>Prior Knowledge</td>
<td>Class Discussion</td>
<td>Class Time</td>
<td></td>
<td>Teacher Effort</td>
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<td></td>
<td>Projects</td>
<td></td>
<td></td>
<td>Enthusiasm</td>
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<td>Questioning</td>
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<td>Approachability</td>
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<td>Problem-based Learning</td>
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<td>Variability</td>
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<td>Contextualizing Content</td>
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Physiological readiness factors that influenced participants’ cognitive engagement were personal stressors, class stressors, and class time. Personal stress included such factors as family problems, employment, sickness, tiredness, money problems, and extracurricular activities. While instructors have little influence over personal stressors, they can help students through stressful times. Instructors need to understand that students’ physiological needs must be met before cognitive engagement can take place (Maslow, 1943).
For motivation, relevance and class reputation surfaced as themes contributing to student engagement. These themes seemingly align with the expectancy-value theory of motivation (Wigfield & Eccles, 2000). However, students indicated they tended to engage more in classes having a reputation as being difficult. Motivational theory would suggest that students engage more when they have a high degree of expectancy for success, but the students in this study reported that they were more engaged in classes perceived as difficult. These results are puzzling because, according to theory, the perceived difficulty of the class should lower students’ self-efficacy and thus their expectancy for success. Additionally, in accordance with the value portion of the expectancy-value theory, the theme of relevance showed that students tend to be more engaged in classes they perceive as valuable to their future.

One interesting finding from this study was the emergence of teacher immediacy. After an examination of the themes of teacher immediacy: teacher caring, teacher effort, teacher enthusiasm, teacher approachability, and personal connection, the determination was made that these closely align with the nonverbal and verbal immediacy behaviors outlined by Gorham and associates (Gorham, 1988; Richmond, Gorham, & McCroskey, 1987). Our initial thought was that the teacher immediacy factors should be grouped into the motivation construct because teacher immediacy has been previously linked with motivation (Kelley & Gorham, 1988; Velez & Cano, 2008). However, past research has suggested that immediacy influences motivation as opposed to being integrated into motivation (Christophel, 1990; Frymier, 1994). The findings of this study point to the work by Christophel (1990) and Frymier (1994); teacher immediacy did not appear to directly influence cognitive engagement, instead influencing students’ motivation to engage.

The results of this study represent only a small number of students in the College of Agricultural and Life Sciences at the University of Florida and are not generalizable farther than the sample. However, several recommendations can be made from the results. First, classroom teachers should put forth the effort to assess students’ existing knowledge in order to link new material to that knowledge. Students do not come to the classroom with a blank slate, and learning theory would state that teaching is more effective when new knowledge is linked to existing knowledge (Dewey, 1938). Second, teachers should attempt to use a variety of active learning strategies that might include discussions, questioning, collaborative group work, projects, presentations, problem-based learning, and role play as outlined by Braxton (2006). Problem-based learning and various other active learning activities designed to foster critical thinking skills increase the cognitive level of teaching in the classroom tying into work by Whittington and colleagues (McCormick & Whittington, 2000; Whittington, 1995; Whittington & Newcomb, 1992; Whittington, Stup, Bish, & Allen, 1997). Additionally, while teachers may not have a direct effect on the physiological readiness of students, they can understand students’ physical and emotional needs and attempt to accommodate students. Instructors who are empathetic to students’ needs might be viewed more favorably by students, thus giving students an increased impetus to engage in class. Lastly, student engagement might be increased when instructors utilize teacher immediacy behaviors in the classroom. Instructors could employ verbal and nonverbal immediacy behaviors, such as calling students by name, using personal stories or examples, moving around the classroom while teaching, smiling at students, and praising students’ work and comments. Use of these types of immediacy behaviors might help make instructors seem more approachable to students, thus increasing motivation. In addition, faculty development programs aimed at helping instructors understand the importance of integrating active, engaging learning activities into their classrooms, as well as to helping instructors understand how to motivate students to engage in classroom learning could prove beneficial.

While small in scope, the results of this study help expand the knowledge concerning teacher behaviors’ contribution to student content engagement. However, this study generated more questions that warrant further investigation. Replications of this study should be conducted to determine if the teacher variables discovered in this study are consistent.
among groups of students in other colleges of agriculture, as well as other educational settings. Additionally, inquiries should be made to determine the relationships of these teacher behaviors with student achievement. This study found that students engaged more in classes they deemed as difficult. Further research should investigate students’ perceptions of and motivation in classes with a reputation for being difficult. Furthermore, an instrument measuring students’ perceptions of specific teacher behaviors that predict engagement should be created. Lastly, an examination of the influence of teacher immediacy on motivation and cognitive engagement should be made.

References


CHRISTOPHER M. ESTEPP is an Assistant Professor of Agricultural Education in the Department of Animal Science at Sul Ross State University, Box C-11, Alpine, TX 79832, cestepp@sulross.edu

T. GRADY ROBERTS is an Associate Professor of Agricultural Education in the Department of Agricultural Education and Communication at the University of Florida, 307B Rolfs Hall, Gainesville, FL 32611, groberts@ufl.edu
Volume 54 • Number 1 • 2013

Ripple Effects
Robert Birkenholz .................................................................1

Competencies and Experiences Needed by Pre-service Agricultural Educators to Teach Globalized Curricula: A Modified Delphi Study
Nathan Conner & T. Grady Roberts ..................................................8

Evaluating the Effectiveness of Traditional Training Methods in Non-Traditional Training Programs for Adult Learners through a Pre-test/Post-test Comparison of Food Safety Knowledge
Caleb D. Dodd, Scott Burris, Steve Fraze, David Doerfert & Abigail McCulloch ..................................................18

Student Motivation for Involvement in Supervised Agricultural Experiences: An Historical Perspective
William A. Bird, Michael J. Martin & Jon C. Simonsen .................................................................31

The Influence of Collaborative Reflection and Think-Aloud Protocols on Pre-Service Teachers’ Reflection: A Mixed Methods Approach
Cory M. Epler, Tiffany A. Drape, Thomas W. Broyles & Rick D. Rudd ..................................................47

The History of Future Farmer Organizations Around the World
James J. Connors ........................................................................60

Leadership Curriculum and Materials Used by High School Agricultural Science Teachers:
A National Study of the Pre-Life Knowledge Days
A. Christian Morgan, Nicholas E. Furman, Diana L. King, Frank B. Flanders & Rick D. Rudd .........................72

How Are We Educating Agricultural Students? A National Profile of Leadership Capacities and Involvement in College Compared To Non-Agricultural Peers
David M. Rosch & Natalie Coers ..........................................................83

Teacher Behaviors Contributing to Student Content Engagement: A Socially Constructed Consensus of Undergraduate Students in a College of Agriculture
Christopher M. Estepp & T. Grady Roberts .................................................................97

Identification and Validation of Agricultural Hazardous Occupations Order Certification Program Instructor Criteria and Competencies
Shannon Snyder, Brian French, William Field, Roger Tormoehlen & Daniel Ess ........................................111

Investigating the Effects of a Math-Enhanced Agricultural Teaching Methods Course
Christopher T. Stripling & T. Grady Roberts .................................................................125

The Effect of Human Capital on Principals’ Decisions to Interview Candidates in Agricultural Education: Implications for Pre-service Teachers
J. Shane Robinson & Marshall A. Baker .................................................................140

A 20-Year Comparison of Teachers’ Self-Efficacy of Agricultural Mechanics Laboratory Management
Billy R. McKim & P. Ryan Saucier .................................................................153

Two Decades of Agricultural Literacy Research: A Synthesis of the Literature
Kristin A. Kovar & Anna L. Ball ........................................................................167

Assessing the Impact of a Semester-long Course in Agricultural Mechanics on Pre-service Agricultural Education Teachers’ Importance, Confidence, and Knowledge of Welding
Brian L. Leiby, J. Shane Robinson & James P. Key .................................................................179

Variable Relationships Affecting Agriscience Teachers’ Stages of Concern for Content Area Reading Strategies
Anna J. Warner & Brian E. Myers ........................................................................193

An Analysis of FFA Chapter Demographics as Compared to Schools and Communities
Shannon Lawrence, John Rayfield, Lori L. Moore & Corliss Outley .................................................................207
Ripple Effects

Robert J. Birkenholz,
The Ohio State University
Distinguished Lecture, American Association for Agricultural Education
May 16, 2012

Dr. Robert J. Birkenholz is a Professor of Agricultural and Extension Education in the Department of Agricultural Communication, Education, and Leadership (ACEL) at The Ohio State University. In 2002, he was appointed Chair of the department and served in that administrative role for two terms. In 2009, Dr. Birkenholz returned to a full-time faculty position in the department where he helped guide the creation of the undergraduate, interdisciplinary minor in Leadership Studies. Dr. Birkenholz has co-authored one book and one book chapter, 41 peer reviewed journal articles, 53 refereed research papers, and numerous other scholarly publications. He has taught a variety of courses in Agricultural Education and Leadership at the undergraduate and graduate levels. He has advised 59 Master’s and 23 doctoral degree graduates. Dr. Birkenholz served as President of the American Association for Agricultural Education (AAAE) and was inducted as an AAAE Fellow in 1998. He received the AAAE North Central Region Outstanding Agricultural Educator award in 2011. He has presented lectures on student-centered learning and leading change at the four state agricultural universities in India. He was recognized in 2008 as a Fellow in the Kellogg Food Systems Leadership Institute.

Keywords: teacher influence, professional development, career development

Thank you for the honor and privilege to be with you here today to present the 2012 AAAE Distinguished Lecture. For the past 30 years I have looked forward to this part of the program with great anticipation. Each year I have tried to guess the identity of the speaker by surveying the crowd to anticipate who might have been selected to deliver the lecture. Most of the time I focus on the wrong person, and get surprised when the name of the speaker is finally revealed. This year the process was a little different for me. Although I didn’t have to wait to learn the name of the speaker . . . I still experienced some anxious moments as Greg Thompson revealed hints about my identity.

When Greg called me last summer, I vividly recall that I was in a pontoon boat on Clear Lake in northern Iowa. The weather was perfect and I was enjoying a cold beverage as my niece steered the boat around the lake with several other family members aboard. I nearly had to pinch myself to make sure that I wasn’t dreaming, because everything seemed so perfect . . . I thought that I surely must have died and gone to heaven. However, Greg brought me back to my senses and assured me that I was not dreaming. Nevertheless, I feel very blessed to have been asked to present the Distinguished Lecture this year. This opportunity is somewhat of a “Bucket List” item for me, and I cannot fully express the depth of my gratitude for being asked to serve as the “Mystery Speaker.” It is indeed both a daunting and humbling experience, as many of the past speakers have acknowledged.

For several years I have pondered the topic that I would speak on, if I were ever selected to present this lecture. However, after Greg’s phone call, I felt compelled to focus on a topic that is very near and dear to my heart, and that is leadership. Not from an academic perspective, but more from a personal point of view.

I have selected the title of “Ripple Effects” for my talk based on an analogy that can be applied to the subject of leadership and especially how leaders influence others, through a ripple effect. However, before I delve into my comments this morning, I would be remiss if I
didn’t say THANK YOU to a few people who have had a tremendous influence on my life, both personally and professionally.

First and foremost, I want to publicly acknowledge my life’s partner – Pam Birkenholz. Pam has been my wife, friend, partner, cheerleader, confidant, and recently my nursemaid . . . in addition to being my very own personal financial planner . . . she frequently reminds me that I am her best customer! Last summer she surprised me at a park near our home in Dublin, Ohio where she had arranged for our two sons, their wives, and our four grandchildren to be present (along with one of her co-workers, who just happened to be an ordained minister) . . . and we renewed our wedding vows. This August we will celebrate our 35th wedding anniversary. One bit of trivia that Greg did not mention was that I asked Pam to marry me only two weeks after we first met in 1976. I want to take this opportunity to publicly acknowledge Pam for all of her love and support through all these years. Thank You! [Using American Sign Language, gestured to Pam: “eye, love, you,” a family custom when communicating with grandchildren on Skype.]

I also would like to express my gratitude to AAAE President-elect, Dr. Greg Thompson, who assumed a professional risk when he invited me to deliver the Distinguished Lecture this year. Greg has always been a great friend since we first met when he was a graduate student and I was on the faculty at the University of Missouri in the mid-1990’s. Greg and his wife Rita are good friends, and we engage in friendly competition for “Grandparent of the Year” honors with regard to our adopted grandchildren, especially Josiah Velez who turns five this year. Pam and I had to transfer our grandparenting rights to Greg and Rita when Josiah’s parents (Jonathan and Tracy Velez) left Ohio State and moved to Oregon State after graduate school a few years ago. Something similar occurred when Jon and Michelle Simonsen moved to the University of Missouri nearly two years ago with their two sons (Nick and Carter) . . . since then, Pam and I have experienced a void as pseudo-grandparents within our extended Ag Ed family. Jonathan Velez is not here as he and Tracy are home caring for Anna Joy who was born two months ago. On a side note, I would also like to say Happy Birthday to Glenn Shinn who celebrated his birthday yesterday.

Next, I would like to express appreciation for three professional colleagues . . . although I don’t believe any of them are present in the audience today . . . for each of them has served as a mentor to me at various points in my career. Although each of them served as professional role models, they also had a profound influence on my personal life as well. Dr. Alan Kahler was my doctoral program advisor at Iowa State University. Dr. Bob Stewart was a colleague on the faculty in agricultural education at the University of Missouri. Dr. L. H. Newcomb provided administrative leadership at the college and departmental levels at The Ohio State University. Each of these individuals, along with countless others too numerous to mention, have served as informal mentors, and as a result, directly influenced my life, both personally and professionally. I feel a deep sense of gratitude and would like to publicly thank each of them for their positive influence on me at various stages of my career.

The last group that I would like to thank includes some of you in the audience today. So before you begin to doze off, or start checking email and texts messages on your cell phones, please permit me to engage in an audience participation exercise. I ask those of you in the audience to stand and remain standing, if you were ever: (a) enrolled in a class that I taught, (b) were advised by me as an undergraduate or graduate student, or (c) had me serve as a member of your graduate program advisory committee. If you meet one or more of these three criteria, please stand and remain standing for a moment. As we look around the room, this group represents some of the people in our profession that I have had some direct contact, and potentially influenced their professional growth and development in some small way. Please know that my purpose for this exercise is not to inflate my own ego, for I know many of you in this room would have a much larger group of professional colleagues standing if you had made a similar request. My purpose here this morning is to illustrate the ripple effect that one person can have after just a few years in this
profession. Nevertheless, for those of you who are still seated, look around this room and please stand if you have either been taught or advised by any of the people who are already standing in the first group. Again, please stand and remain standing. This extended group illustrates the second wave of the ripple effect that occurs as faculty in our program work with students over a period of years. Henry Adams succinctly captured the essence of this concept with his quote: *Teachers affect eternity; you can never tell where their influence stops.* This is a visual illustration of the topic that I will address in my comments this morning, again, based on the title of Ripple Effects. Thank you for your involvement with this exercise. Feel free to take your seats.

Let me start this morning by establishing the general context for the topic. Each of us, in the daily routines of our lives, fulfills our roles and responsibilities with varying degrees of intentionality. We tend to be very purposeful and intentional with respect to our teaching, research, and outreach roles. But we may not fully recognize and appreciate the potential influence and impact that we have on those around us in less formal situations. As current or future faculty members, or as colleagues in other professional roles, we have numerous opportunities to interact with many people through our daily interactions. It is important that we recognize the enormous potential we have to motivate, guide, and influence our students, advisees, peers, and even our supervisors and administrators each and every day.

Although this lecture began with me expressing appreciation for those who have touched my life in the past, I am reminded of the legendary football coach at Ohio State, Woody Hayes, who has become a folk hero with regard to some of his philosophical principles. Woody believed that it was not so important to pay someone back for their good deeds that they have done . . . Coach Hayes believed in the power of *Paying It Forward* . . . *Paying It Forward* is what I hope to accomplish with each of you in the time that I have this morning. My goal is to *Pay It Forward* with regard to an important leadership concept that I learned several years ago, hoping that I can create a ripple effect among you, which will subsequently ripple outward as you influence others around you back at home.

The key point of my message today is that we recognize the potential ripple effect that we have on those around us. Although we may only be able to observe the direct influence that we have on people in our immediate circles, we can also create circles of influence that ripple outwardly toward others, even though we may not have direct contact with them.

Another characteristic of the ripples that are created when you toss a stone into a body of water is that the concentric circles reflect a symmetrical balance, which can continue for a period of time and slowly fade away. However, if there are barriers present, the ripples tend to be short-lived and dissipate rather quickly. The ripple effect analogy can also be applied to our personal and professional lives. The ripples in our lives that are smooth and symmetrical are a reflection of our success and self-satisfaction, which enhances our potential to exert a positive influence on others. Although we each fulfill various roles in our professional, personal, social, and family lives . . . we are one person; which is the common denominator in our ripple effect analogy . . . each of us is like a stone tossed into a pond . . . which produces the first ripple. We do not know when, where, or how long those ripples will last, but they have the potential to influence many other people as they move outward simultaneously, in all directions.

As I mentioned earlier, we each fulfill different roles in our personal and professional lives; however it is important for us to be the same person in each of those roles. It is unnecessary and unhealthy to create a personal identity that is unique to each role. Some of you may have observed friends or colleagues who strive to maintain identities that are unique to each of their life roles. My advice on this topic is straightforward and simple, be the best person that you can be and be the same person in each of your life roles. It takes enormous personal effort and creates unhealthy personal stress to maintain a professional identity that is different than your personal identity. Living with integrity (which is the most basic foundation of
effective leadership) implies that we are genuine and consistent in our behavior. In doing so, we must avoid projecting a façade that does not reflect the true nature of who we are as a person, regardless of the context.

Let me now return to a comment that I made earlier about the importance of balance in our lives. Several years ago, as a young Assistant Professor, I recall attending a meeting that included a presentation by Carl Clayton who was a professional development and public relations specialist with A. O. Smith Harvestore, Inc. Mr. Clayton’s presentation was an eye-opening experience for me as he presented a compelling case for living a balanced life. Carl identified seven key dimensions in life and emphasized the importance of each dimension to our overall success in life, not measured by how much wealth we had accumulated or how hard we worked, but measured by our sense of personal satisfaction and fulfillment with our life as a whole.

The seven dimensions were illustrated as spokes on a wheel, labeled as: Physical, Social, Mental, Spiritual, Financial, Career, and Family. The first four dimensions (mental, physical, spiritual, and social) were defined as foundations (essentially cornerstones) for living a full and satisfying life. However, the other three dimensions (career, financial, and family) are where many of us invest much of our time, energy, and resources as we seek climb the ladder of success. In the few minutes remaining, I would like to briefly examine each of these dimensions and then summarize with some thoughts about the importance of seeking balance among them.

Let’s start with the Physical dimension. It should be fairly clear to all of us, that maintaining our personal health is an important factor that has a long-lasting and cumulative effect on our personal and professional well-being. Health and wellness have become a high priority in our society as we recognize the relationship between personal health and well-being, both personally and professionally. Having recently undergone surgery for prostate cancer, I can attest to the importance of healthy living by eating right, exercising, and avoiding unhealthy behaviors. Smoking, binge drinking, and illicit drug use are extreme examples of unhealthy behaviors; but we should also recognize the danger of even moderately unhealthy behaviors over the long term. So my question to you is this: What are you doing on a regular basis to monitor and improve your physical health? Clearly, long term career success is dependent upon good health and each of us is responsible for maintaining our health by living a healthy lifestyle.

The Social dimension is also very important based on the fact that as humans, we are all social creatures. We each have the need to interact with others on an informal basis to lead full and satisfying lives. Social interaction often occurs through communication with friends and colleagues, both within and outside the work environment. Socializing is a mechanism that allows people to relax, reenergize, and overcome anxieties commonly associated with our personal and professional roles. Emerging technologies such as cell phones, email, and social media appear to enhance opportunities for socialization, at least virtually; however it is not clear if electronic communication replaces our need for interpersonal interaction. Are you maintaining contact with a circle of close friends, and/or neighbors that strengthens the social dimension of your life? Without a supporting network of social contacts, we often become too narrowly focused on our careers. Upon retirement, is it reasonable to expect to be able to establish a social network outside the work environment that has not been cultivated in prior years? Human beings are social creatures, and we each need to take time to develop and maintain social contacts beyond our workplace and career contexts.

The third area identified in Clayton’s Wheel of Life was labeled the Mental dimension. People benefit from mental stimulation that challenges their ability to think, process information, and make decisions.
Clearly, mental processing follows the saying “use it or lose it” whereby individuals who are not challenged to grow in their personal or professional lives, seem to suffer from a reduced ability to think rationally in a changing world. Mental stimulation can occur in a wide variety of settings from classrooms to research labs to individual conversations; however, it is clear that when individuals avoid challenging their mental capacity, atrophy can result. Have you read a good book or attended a stimulating lecture recently . . . simply for pleasure? Or how about taking time away from your work to clear your mind in order to return with a renewed sense of energy, purpose, and vision? Sometimes, we become victims of our heritage, and the strength of our work ethic causes us to overlook the periodic need to recharge our mental batteries. Some like to jog . . . others play golf . . . what activities do you enjoy that contribute to your mental health?

The fourth dimension identified by Clayton regarding Spirituality often causes people to squirm in their seats. Many people equate spirituality with religion. Although the spiritual dimension encompasses religion, spirituality is a broader concept. The Spiritual dimension assumes the existence of a higher power in the universe, and that each of us has been placed on this earth to serve a purpose. Seeking to define one’s purpose in life and to pursue that calling is prerequisite to achieving self-satisfaction. Failing to define one’s purpose in life can result in feeling empty and unfulfilled, questioning our existence on this earth. Achieving a sense of balance in our spiritual life involves recognizing who we are as a person and why we exist on this earth. For example, I have concluded that my overall purpose in life is simply to help others be successful. Gaining that perspective has been helpful as I fulfill my roles as a husband, father, teacher, and advisor . . . along with many other roles that I have in life. Knowing what I perceive as my purpose . . . helps me to balance the spiritual dimension in my life. Do you have a clear picture of your purpose in life? Think about times when you felt the greatest sense of fulfillment or satisfaction in your life. Those times provide clues regarding your life’s purpose. Once identified, it is stimulating to think about your roles and responsibilities in the context of serving a higher purpose. Clearly defining a purpose for your life will have a profound effect on how you live and how you interact with those around you.

As I mentioned earlier, the first four dimensions (Physical, Social, Mental, and Spiritual, which equate to body, heart, mind, and soul) are foundational cornerstones that require some degree of balance for us to achieve a sense of self-satisfaction and personal fulfillment in life. Neglecting any one of those dimensions over the long run can have negative implications and potentially jeopardize your potential for success and personal fulfillment. Although balancing the four dimensions will not guarantee self-satisfaction . . . imbalance among those dimensions often results in feeling that life is not all that it could be . . . that something is lacking.

Likewise, overinvesting in one of these dimensions at the expense of another can result in serious consequences. For example, many times our students tend to emphasize the mental and social dimensions of their lives, but neglect the physical and spiritual dimensions. Over time, such an imbalance may result in an assortment of health problems and or soul-searching, leading them to question decisions about their career path. Ultimately, each of us needs some degree of balance among the four foundational dimensions in order to achieve a sense of personal satisfaction and fulfillment in our lives.

The last three dimensions that I would like to discuss this morning include career, financial, and family. Career is an easy dimension to address in this context because we often place high emphasis and expend our personal time and energy on advancing our careers, or career preparation in the case of students. For many of us, our personal identity is closely linked to our professional identity. This is especially important when you begin to contemplate retirement at some point in the future, by asking: ‘Who am I?’ after I retire. If I am no longer a professor, a teacher, an advisor, a researcher, etc. then how do I define myself as a person? Again, a healthy balance between our personal and professional lives is necessary for us to achieve satisfaction and fulfillment in life. Are
you keeping your career in proper perspective with regard to the other dimensions? Are other dimensions being sacrificed by an over-emphasis on your career? Often, it is the family and physical dimensions that suffer. Again, balanced living is the key to long-term fulfillment and satisfaction in life.

The Financial dimension is another area that is very personal in nature and not openly discussed in professional circles. However, we are each responsible to be stewards of our resources. We are responsible for managing our personal and professional resources, both now and in the future. Specifically, that means that we need to be able to support ourselves, live within our means, manage our spending, save for the future, and plan for long-term goals. Social security and pension plans are great programs; however, we need to manage our financial resources in order to help us achieve our personal and professional goals. One tip that I learned several years ago was to redirect a portion of my merit raise each year into a personal savings account or IRA, based on the assumption that I wouldn’t feel the pain of reducing my income if the funds were diverted before they ever appeared in my pay check. Following this strategy, Pam and I have helped to fund three undergraduate scholarships at Iowa State, Missouri, and Ohio State in our desire to “Pay It Forward” with respect to the educational opportunities and professional support that I received from each of those institutions. Over time, by re-directing a small portion of my salary increase each year to fund those scholarships, we have made a real difference in the lives of undergraduate students at those institutions – literally for eternity -- another good example of the ripple effect created by Paving It Forward! Do you have clear goals for your financial future? Have you developed strategies to achieve those goals? There are many different programs and resources available to help us make good financial decisions . . . however, each of us has the ultimate responsibility to live within our means and plan for our financial future. The key is don’t procrastinate – start today!

Family is the seventh dimension that Carl Clayton identified that contributes to a sense of fulfillment in our lives. Although we each have unique circumstances in our families, the key point is the connection and commitment that we have to our family members. Spouses, children, parents, siblings, and other family members . . . . each provide blessings and challenges that influence our sense of satisfaction in life. For some, we have an extensive family and are challenged to maintain meaningful relationships with all of them. For others, we may have smaller families or live some distance away from them. Regardless of the size and scope, the important question is the quality of the relationship that you have with your family. Do you experience a satisfactory and fulfilling relationship with your family? Or do you feel estranged from one or more family members? Once again, this is a difficult topic to address openly; however it is clear that we are not able to compartmentalize our professional lives, separate and distinct from our personal lives. If we have family relationships that create stress in our personal lives, ultimately that stress can carry over into our professional lives, influencing our performance and productivity if left unresolved. Family members serve as a great source of support and encouragement when we face challenges or difficulties in our professional roles. However, there may be times when family situations distract our attention and divert our energy from fulfilling our professional roles. For those times, employee assistance programs can provide a confidential and objective source of support. We need to have the courage and resolve to seek out such assistance when we find ourselves in times of need. Both for our own good, but also for the benefit of those with whom we work on a daily basis.

Carl Clayton used a self-assessment instrument in his presentation several years ago, similar to one that has been distributed to you. During his presentation, Clayton asked us to use a seven-point scale in which 1 was poor and 7 was excellent to rate our sense of satisfaction or fulfillment on each dimension. After completing our individual ratings, we were asked to draw a line connecting the ratings on adjacent spokes. As you study the shape of your results . . . Do you perceive your wheel to be somewhat
balanced and symmetrical? . . . which corresponds with a relatively smooth ride as you travel down the superhighway of your life. On the other hand, if there is severe imbalance among the seven dimensions, you might expect a bumpier ride. Experiencing imbalance among the four foundational dimensions (physical, social, mental, and spiritual, located across the bottom of the wheel) may inhibit our potential satisfaction in the financial, career, and/or family dimensions.

Tradeoffs are also an important factor to consider in balanced living. Some individuals (knowingly or unknowingly) sacrifice certain dimensions of their lives (at least in the short run) to place more emphasis on other dimensions. Graduate students often make sacrifices in the financial and family dimensions of their lives in the short run in order achieve long term career goals. Such tradeoffs are fine, so long as it is a conscious decision, and only for a short period of time. But if you are feeling dissatisfied or unfulfilled for some reason, you might want to examine the seven dimensions to determine if you are experiencing life balance issues that may need to be addressed.

As I mentioned earlier, each of us in our professional roles have unique opportunities to interact with professional colleagues at various levels and contribute to their development and success in various ways. Living a balanced life not only contributes to our own sense of success and fulfillment . . . but also allows each of us to Pay it Forward by influencing others through the ripple effect. Zig Ziglar has been quoted as saying “You can get what you want, if you help enough other people get what they want!” I hope that each of you has been challenged to seek and maintain balance among these seven dimensions in your life. I truly believe that doing so will enhance your potential for professional success and personal satisfaction in your life . . . and you in turn may have a similar effect on those around you back at home. If my comments have contributed in some small way to your success, then I will have truly have Paid it Forward and fulfilled my purpose here this morning!

Thank you for the opportunity to share these thoughts with you today. It is truly been an
Competencies and Experiences Needed by Pre–service Agricultural Educators to Teach Globalized Curricula: A Modified Delphi Study

Nathan Conner
T. Grady Roberts
University of Florida

The 21st century graduate must be able to interact with people from all over the world and must also be knowledgeable about the world (Longview Foundation, 2008). In order to produce graduates that are globally competent, The National Council for the Accreditation of Teachers (NCATE, 1982) has mandated that multi–cultural education be incorporated as part of the teacher–preparation curricula. The purpose of this study was to identify competencies and experiences needed by agricultural pre–service teachers in order to teach globalized curricula. A modified Delphi method was used and the panel consisted of 13 (n = 13) experts in the field of agricultural teacher education with additional experience in international agricultural education or extension. Twenty competencies and two experiences were identified for pre–service agricultural educators to teach globalized curricula at the high school level.

Keywords: agricultural education; competencies; globalized curricula; Delphi; pre–service teachers

The agricultural industry represents a global marketplace where producers purchase inputs from around the world and sell their outputs to consumers across the globe (National Research Council, 2009). The expectations on college graduates have changed immensely due to the nature of today’s agricultural industry. A 21st century graduate “will need extensive knowledge of the world and the skills and dispositions to engage with people from many cultures and countries” (Longview Foundation, 2008, p. 3). The National Research Council (2009) recognized a need to expose undergraduate agricultural students to international perspectives in preparation for their future agricultural careers and recommended the following: (a) learning–abroad programs; and (b) the infusion of international perspectives into traditional agricultural courses.

These global expectations are not limited to college graduates. Employers recognize the importance of hiring high school graduates with the skills that promote effective interaction with people on a global level (Longview Foundation, 2008). Employers prefer to hire graduates who are globally competent. According to the Longview Foundation, a globally competent student has:

- Knowledge of and curiosity about the world’s history, geography, cultures, environmental and economic systems, and current international issues
- Language and cross–cultural skills to communicate effectively with people from other countries, understand multiple perspectives, and use primary sources from around the globe
- A commitment to ethical citizenship (p. 7)

In order for high schools to produce globally competent graduates, the teachers and the curricula must encourage and promote the importance of globalization and multi–culturalism. If teachers are not globally competent, it is unlikely that they will be able to prepare their students to be globally competent. The National Council for the Accreditation of Teachers (NCATE, 1982), mandated that multi–cultural education be incorporated into existing teacher–preparation programs. Multi–cultural education could be implemented in many differ-
Managing Education in a Global Economy

Specifically, the researchers were interested in identifying what pre-service teachers should know in order to teach a globalized agricultural education. The theoretical framework for this study was based on constructivism and experiential learning to guide the inquiry (Doolittle, 1996; Ormrod, 2008).

This study was based in the context of agricultural education, teacher-education programs. Cruickshank (1984) proposed a model of teacher-education reform. He focused on the importance of culturally diverse students and the need to have international experiences in the educational experience of teachers. This research was grounded in these ideas. The theoretical framework for this study was based on constructivism and the idea that all knowledge is constructed from experience (Doolittle, 1996; Ormrod, 2008).

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tion had “significant experiences with people different from themselves” (p. 440), awareness of discrimination and injustice, been a minority, and “most importantly, they are conscious of how human differences are used by people in power to rationalize inequities, maintain their privilege and promote their culture as superior” (p. 440). Merryfield also found that “teacher educators in the study recognize that it is the interaction of identity, power, and lived experiences that has led to their work in multi-cultural and global education” (p. 441). Teacher educators are not successfully preparing future teachers to engage and teach from a multi-cultural and global perspective (Merryfield, 2000). Merryfield concluded that teacher-education programs must hire educators that have knowledge, experiences, and awareness of multi-cultural and global education in order to prepare students for global interconnectedness. It is up to teacher educators to promote an environment that encourages multi-cultural appreciation within the pre-service teacher program (Ambe, 2006).

In summary, the existing literature addresses what teachers should know about multi-cultural education and just scratches the surface with regards to international knowledge required of teachers. The literature also barely addresses international knowledge of college-level agricultural education students. In addition, the literature examines the knowledge required of teacher-educators. Although insightful, the existing literature fails to indicate which competencies and experiences a secondary agricultural education teacher needs to effectively teach globalized curricula.

**Purpose and Objectives**

The purpose of this study was to determine what pre-service agricultural educators would need in order to teach globalized curricula. The specific objectives were:

1. Identify global competencies that pre-service agricultural educators should possess before entering the teaching profession.
2. Identify global experiences that pre-service agricultural educators should obtain before entering the teaching profession.

**Methods**

A modified Delphi method was used for this study due to its acceptance and ability to identify a consensus from a panel of experts (Dalkey, 1969; Helmer, 1966; Stufflebeam, McCormick, Binkerhoff, & Nelson, 1985). The methods for this research were approved by the Institutional Review Board from the University of Florida. Three rounds of data collection were used to solicit the opinions of an expert panel. The criterion for membership on the panel was twofold: (a) the person must be currently working as a teacher-educator in agricultural education and (b) the person must have been involved in an international agricultural education or extension project. The researchers determined that these individuals would have the expertise to know what would be necessary to teach a globalized high school agriculture curricula and the expertise to understand what would be necessary to prepare a pre-service teacher for this task. The expert panel was formed using a snowball-sampling method (Goodman, 1961). To begin forming the panel, 4 agricultural education faculty from various institutions were identified as having considerable experience in this area and meeting the criterion. They were each asked to identify 4 or 5 additional agricultural educators that met the criteria. A total of 17 potential agricultural educators were identified and invited to participate in the study. A total of 13 experts representing 12 agricultural education programs throughout the United States agreed to participate.

Data were collected via an online survey tool called Qualtrics. Notifications for each round of the study were sent to each panelist using an email with a link to the questionnaire. The timing of pre-notice, notice, and follow-up emails were developed based on Dillman, Smyth, and Christian’s (2009) Tailored Design Method.

Round 1 of the study comprised of one open-ended question, “What competencies and experiences would a pre-service teacher need to effectively teach globalized agricultural curricula in the high school?” The responses to the ini-
tial question were analyzed and categorized using a constant–comparative method (Glaser & Strauss, 1967). Response statements that were deemed to have the same meaning as response statements from other participants were condensed to one response statement. The response statements were categorized into competencies and experiences. Nine of the 13 members responded (69%) and identified 24 competencies and 18 experiences.

Round 2 consisted of a 42–statement questionnaire based on the findings from Round 1. The panelists utilized a five–point rating scale to rank their level of agreement or disagreement (strongly disagree, disagree, neither disagree nor agree, agree, strongly agree). The panelists were also given the opportunity to suggest rewording of competencies and experiences and to suggest additional competencies and experiences. Thirteen members of the panel responded (100%) to the competency section of the questionnaire and 12 members of the panel responded (92%) to the experience section of the questionnaire. Upon completion of Round 2, the competencies and experiences were analyzed to determine which competencies and experiences would move on to Round 3. It was determined a priori that competencies and experiences with at least two–thirds of the panelists choosing agree or strongly agree would move on to round three. The panel members agreed on 24 competencies and 11 experiences. Two additional competencies were suggested in Round 2 and added for Round 3 based on the recommendations of panel members. Twelve competencies and experiences were also reworded based on suggestions from the panel.

Round 3 consisted of 24 competencies and 11 experiences in which the panelists were asked to use a dichotomous scale to indicate whether or not they agree or disagree with each competency and experience. The panelists were provided with the utilized statistics from Round 2 and also told which competencies and experiences were reworded. An 80% agreement rate was determined a priori to indicate that the competency or experience would be retained. Twelve participants responded to round 3.

Results

Round 1

Round 1 was designed to solicit a comprehensive list of competencies and experiences that pre–service agricultural educators might have in order to teach globalized curricula. As mentioned before, the open–ended prompt used to develop the lists was, “What competencies and experiences would a pre–service teacher need to effectively teach globalized agricultural curricula in the high school?” Panelists proposed 24 potential competencies and 18 potential experiences from the open–ended prompt. The identified competencies are presented in Table 1 and experiences are presented in Table 2.
Table 1
Descriptive Statistics of Competencies by Delphi Round 1 and 2

<table>
<thead>
<tr>
<th>Competencies Identified in Round 1</th>
<th>Round 2 (n = 13) Agree/Strongly Agree %</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Understand the connection between local agricultural production and the global agricultural economy</td>
<td>100.00&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>2. Understand the global interconnectedness of agricultural production systems (e.g. sources of production inputs such as seed, seedstock, fertilizer, livestock breedstock, etc.)</td>
<td>100.00&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>3. Understand the connection between the global economy and United States economy</td>
<td>100.00&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>4. Understand international issues that affect agriculture</td>
<td>100.00&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>5. Understand the role of agriculture in developing countries</td>
<td>100.00&lt;sup&gt;a&lt;/sup&gt;-&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>6. Understand the importance of global agriculture</td>
<td>92.30</td>
</tr>
<tr>
<td>7. Understand agricultural production and commodities in major world regions</td>
<td>84.61</td>
</tr>
<tr>
<td>8. Have knowledge of international trade related to agricultural commodities</td>
<td>84.61&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>9. Have knowledge of the domestic and international agencies that impact agricultural</td>
<td>84.61&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>10. Understand the relationship between food security, national security, and political/cultural stability</td>
<td>84.61&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>11. Have an appreciation for cultural differences including religion, language, customs, and food</td>
<td>84.61</td>
</tr>
<tr>
<td>12. Have knowledge of world geography</td>
<td>91.66&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>13. Understand international trade agreements</td>
<td>76.92</td>
</tr>
<tr>
<td>14. Have knowledge of United States policies affecting global agriculture</td>
<td>76.92&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>15. Knowledge of agricultural education in international settings</td>
<td>76.92&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>16. Have knowledge about the culture of at least one other country</td>
<td>76.92&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>17. Have knowledge of the major subcultures in the United States</td>
<td>76.92&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>18. Understand the role that religion plays in politics, production practices, customs, and cultures</td>
<td>76.92&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>19. Have knowledge of global agricultural corporations</td>
<td>69.23&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>20. Be aware that cultural differences does not make a person wrong, bad, an enemy, or stupid</td>
<td>66.66&lt;sup&gt;a&lt;/sup&gt;-&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>21. Understand agriculture from multi–cultural perspectives</td>
<td>66.66&lt;sup&gt;a&lt;/sup&gt;-&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>22. Understand aspects of global climate change likely to impact agricultural and food production worldwide</td>
<td>66.66&lt;sup&gt;a&lt;/sup&gt;-&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>23. Be open–minded</td>
<td>53.84</td>
</tr>
<tr>
<td>24. Understand the biological, social, and emotional similarities of people throughout the world</td>
<td>53.84</td>
</tr>
</tbody>
</table>

<sup>a</sup>Reworded after Round 2. <sup>b</sup>Only 12 panelists responded to this competency
Table 2

Descriptive Statistics of Experiences by Delphi Round 1 and 2

<table>
<thead>
<tr>
<th>Experiences Identified in Round 1 or 2</th>
<th>Round 2 ((n = 12))</th>
<th>% Agree/Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Interact with people working in the international agricultural field</td>
<td>91.66</td>
<td></td>
</tr>
<tr>
<td>2. Interact with agricultural students in another country (using a variety of technologies)</td>
<td>83.33</td>
<td></td>
</tr>
<tr>
<td>3. Complete training on how to use a globalized curriculum</td>
<td>83.33</td>
<td></td>
</tr>
<tr>
<td>4. Complete an international agricultural course</td>
<td>75.00</td>
<td></td>
</tr>
<tr>
<td>5. Interact with international students on campus</td>
<td>75.00</td>
<td></td>
</tr>
<tr>
<td>6. Complete a short term study tour abroad in agriculture</td>
<td>66.66</td>
<td></td>
</tr>
<tr>
<td>7. Complete a multi–cultural/diversity course</td>
<td>66.66</td>
<td></td>
</tr>
<tr>
<td>8. Complete a course that focuses on the global economy</td>
<td>66.66</td>
<td></td>
</tr>
<tr>
<td>9. Interact with international faculty on campus</td>
<td>66.66</td>
<td></td>
</tr>
<tr>
<td>10. Interact with people of different cultures</td>
<td>66.66</td>
<td></td>
</tr>
<tr>
<td>11. Teach others about international agriculture and globalization</td>
<td>66.66</td>
<td></td>
</tr>
<tr>
<td>12. Have an International experience of any type</td>
<td>58.33</td>
<td></td>
</tr>
<tr>
<td>13. Complete an American history course</td>
<td>58.33</td>
<td></td>
</tr>
<tr>
<td>14. Take a virtual field trip</td>
<td>58.33</td>
<td></td>
</tr>
<tr>
<td>15. Complete a world history course</td>
<td>41.66</td>
<td></td>
</tr>
<tr>
<td>16. Complete an international agricultural internship</td>
<td>25.00</td>
<td></td>
</tr>
<tr>
<td>17. Complete a semester long study abroad in agriculture</td>
<td>25.00</td>
<td></td>
</tr>
<tr>
<td>18. Complete a concentration of study in a particular region of the world</td>
<td>16.66</td>
<td></td>
</tr>
</tbody>
</table>

**Round 2**

In Round 2, the panelists were given the opportunity to identify their level of agreement for each competency and experience identified through Round 1 of the study. Panelists rated each item using a five–point rating scale. Panelists were also given the opportunity to reword items or suggest additional items to the competency and/or experience list. As previously mentioned, it was determined a priori that competencies and experiences with at least two-thirds of the panelists choosing agree or strongly agree would move on to round three. Round 2 results for competencies are presented in Table 1 and Round 2 results for experiences are presented in Table 2. Based on the results, the competency be open minded was dropped after Round 2 because less than two-thirds of the panelists agreed or strongly agreed with the competency.

Based on feedback from the panel, seven experiences were also dropped after Round 2 due to having less than two-thirds of the panelists agree or strongly agree with the experience: (a) Have an International experience of any type, (b) Complete an international agricultural internship, (c) Complete a semester long study abroad in agriculture, (d) Complete a world history course, (e) Take a virtual field trip, (f) Complete a concentration of study in a particular region of the world, and (g) Complete a world history course. Panelists suggested that two additional competencies be added for consideration in Round 3: (a) Describe the nutritional needs of individuals as it relates to protein needs, vitamins/minerals, carbohydrates, etc. and (b) Discuss how human nutritional needs relate to the commodities raised in the various regions of the world. Thus, 24 competencies and 11 experiences moved on to Round 3.

**Round 3**

In Round 3, panelists were asked to agree or disagree with each competency and experience that made it to the final round. As mentioned before, it was determined a priori that competencies and experiences with a minimum of 80% panelist agreement would be retained. Complete
results for competencies are presented in Table 3 and experiences are presented in Table 4. Panelists came to consensus on 20 competencies. The following four competencies were dropped after Round 3: (a) Describe agricultural education in international settings, (b) Identify major subcultures in the United States, (c) Discuss aspects of global climate change likely to impact agricultural and food production worldwide, and (d)

Describe the nutritional needs of individuals as it relates to protein needs, vitamins/minerals, carbohydrates, etc. Interestingly, panelists came to consensus on only 2 out of the 11 experiences, Interact with people working in the international agricultural field and Complete training on how to use a globalized curriculum.

Table 3
Descriptive Statistics of Competencies for Delphi Round 3 (n=12)

<table>
<thead>
<tr>
<th>Competencies</th>
<th>Agree %</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Describe the relationships between local agricultural production and the global agricultural economy</td>
<td>100.00</td>
</tr>
<tr>
<td>2. Describe the global interconnectedness of agricultural production systems (e.g. sources of production inputs such as seed, seedstock, fertilizer, livestock breedstock, etc.)</td>
<td>100.00</td>
</tr>
<tr>
<td>3. Describe the connection between the global economy and United States economy</td>
<td>100.00</td>
</tr>
<tr>
<td>4. Describe the relationship between food security, national security, and political/cultural stability</td>
<td>100.00</td>
</tr>
<tr>
<td>5. Identify international issues that affect agriculture</td>
<td>100.00</td>
</tr>
<tr>
<td>6. Describe how U.S. policies affect global agriculture</td>
<td>100.00</td>
</tr>
<tr>
<td>7. Describe the role of agriculture in developing countries</td>
<td>100.00</td>
</tr>
<tr>
<td>8. Explain the importance of global agriculture</td>
<td>100.00</td>
</tr>
<tr>
<td>9. Explain how agricultural commodities are traded internationally</td>
<td>91.66</td>
</tr>
<tr>
<td>10. Describe how domestic and international agencies affect agricultural trade</td>
<td>91.66</td>
</tr>
<tr>
<td>11. Discuss cultural differences including religion, language, customs, and food</td>
<td>91.66</td>
</tr>
<tr>
<td>12. Describe the culture of at least one other country</td>
<td>91.66</td>
</tr>
<tr>
<td>13. Recognize that cultural differences do not make a person wrong, bad, an enemy, or stupid</td>
<td>91.66</td>
</tr>
<tr>
<td>14. Discuss agriculture from multi-cultural perspectives</td>
<td>91.66</td>
</tr>
<tr>
<td>15. Describe agricultural production and commodities in major world regions</td>
<td>83.33</td>
</tr>
<tr>
<td>16. Describe international trade agreements</td>
<td>83.33</td>
</tr>
<tr>
<td>17. Identify major global agricultural corporations</td>
<td>83.33</td>
</tr>
<tr>
<td>18. Describe the role that religion plays in politics, production practices, customs, and cultures</td>
<td>83.33</td>
</tr>
<tr>
<td>19. Discuss their knowledge of world geography</td>
<td>83.33</td>
</tr>
<tr>
<td>20. Discuss how human nutritional needs relate to the commodities raised in the various regions of the world</td>
<td>83.33</td>
</tr>
<tr>
<td>21. Describe agricultural education in international settings</td>
<td>75.00</td>
</tr>
<tr>
<td>22. Identify major subcultures in the United States</td>
<td>75.00</td>
</tr>
<tr>
<td>23. Discuss aspects of global climate change likely to impact agricultural and food production worldwide</td>
<td>66.66</td>
</tr>
<tr>
<td>24. Describe the nutritional needs of individuals as it relates to protein needs, vitamins/minerals, carbohydrates, etc</td>
<td>58.33</td>
</tr>
</tbody>
</table>

New competency added after Round 2
### Table 4

*Descriptive Statistics of Experiences for Delphi Round 3 (n=12)*

<table>
<thead>
<tr>
<th>Experiences</th>
<th>Agree %</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Complete training on how to use a globalized curriculum</td>
<td>100.00a</td>
</tr>
<tr>
<td>2. Interact with people working in the international agricultural field</td>
<td>81.81a</td>
</tr>
<tr>
<td>3. Interact with international faculty on campus</td>
<td>75.00</td>
</tr>
<tr>
<td>4. Interact with people of different cultures (using a variety of technologies)</td>
<td>72.72a</td>
</tr>
<tr>
<td>5. Interact with agricultural students in another country</td>
<td>72.72a</td>
</tr>
<tr>
<td>6. Teach others about international agriculture and globalization</td>
<td>72.72a</td>
</tr>
<tr>
<td>7. Complete a short term study tour abroad in agriculture</td>
<td>66.66</td>
</tr>
<tr>
<td>8. Complete an international agricultural course</td>
<td>66.66</td>
</tr>
<tr>
<td>9. Complete a course that examines working in a multi-cultural environment</td>
<td>66.66</td>
</tr>
<tr>
<td>10. Complete a course that focuses on the global economy</td>
<td>66.66</td>
</tr>
<tr>
<td>11. Interact with international students on campus</td>
<td>66.66</td>
</tr>
</tbody>
</table>

*a Only 11 panelists responded to this experience

### Conclusions, Discussion, and Implications

Agricultural teacher educators who participated on the expert panel came to a consensus that pre–service agricultural educators need 20 competencies and 2 experiences in order to teach a globalized curriculum at the high school level. The data collected from this study indicated that the number of competencies by pre–service agricultural educators to teach globalized curriculum in the high school exceeded the number of experiences needed. The 20 competencies (see Table 3) could be categorized as competencies related to agricultural production, economics, political/policy, and social/cultural. One experience (*Complete training on how to use a globalized curriculum*) focused on pedagogical development, the other (*Interact with people working in the international agricultural field*) focused on developing knowledge based on the experiences of others.

The competencies identified support and expand the Longview Foundation’s characteristics of a globally competent student (2008). A globally competent student is able to “describe a body of knowledge about world regions, cultures, and global issues, and skills and dispositions to engage responsibly and effectively in a global environment” (Longview Foundation, 2008, p. 7). The findings in the current study add an agricultural context to the previously identified characteristics of a globally competent student. However, the panelist rejected the experiences that required the pre–service agricultural educators to interact with people of different cultures. It is interesting to think about why the panelists disregarded the experience. Merryfield (2000) found that cultural interaction for teacher educators was an important experience to have. Why are cultural interactions an important experience for teacher educators and not pre–service agricultural educators? Another experience not deemed necessary was a study–abroad experience for pre–service agricultural educators. This finding was inconsistent with the National Research Council (2009), which advocated international experiences for all agricultural students.

To allow pre–service agricultural educators to construct (Doolittle & Camp, 1999; Fosnot, 1996; Ormrod, 2008; Roberts, 2006; Steffe & Gale, 1995) their understanding of teaching globalized agriculture curricula, the context and content (Cruickshank, 1984) of agricultural education programs should be adjusted to include the competencies and experiences identified in this study. This may include changing degree requirements, redesigning courses, and/or developing curricula training sessions. Exposing the pre–service teachers to the globalized competencies and experience will allow students’ to organize the competencies and experiences in a way that allows them to construct knowledge (Ormrod, 2008).

Given the espoused emphasis on experiential learning in agricultural education (Roberts & Harlin, 2007), it is interesting to speculate why the panel failed to agree on so many of the pro-
posed experiences. One panelist offered some insight into his rationale. He suggested that each of the proposed experiences is valuable, but all of them are not realistic and are not needed to effectively teach globalized curricula (R. Terry, personal communication, July 26, 2011). Although it cannot be certain if all the panelists thought the same way, it would appear that the pragmatic nature of agricultural teacher educators trumped the desire to include more experiential activities.

This study is just beginning to fill this gap in the knowledge base. Further research in this area is needed in order to continue the development of a theoretical base for the competencies and experiences needed by pre-service agricultural educators in order to teach globalized curricula. Additionally, further research is necessary to address the following questions:

1. To what extent are pre-service agricultural educators across the nation developing the identified global competencies and having the identified experiences during their teacher preparation program?
2. What method or methods can be implemented to effectively and efficiently develop these competencies and provide these experiences?
3. What is the student perception regarding the identified global competencies and experiences?
4. Are some of the identified global competencies and experiences more important than others for pre-service agricultural educators?
5. Do the identified global competencies and experiences make pre-service agricultural educators more effective at teaching a globalized curriculum than their peers that do not possess the same competencies and experiences?

References


NATHAN W. CONNER is a Graduate Teaching/Research Assistant in the Department of Agricultural Education and Communication at the University of Florida, 310 Rolfs Hall, Gainesville, FL 32611, nathan.conner@ufl.edu.

T. GRADY ROBERTS is an Associate Professor of Agricultural Education in the Department of Agricultural Education and Communication at the University of Florida, 117C Bryant Hall, Gainesville, FL 32611, groberts@ufl.edu
Evaluating the Effectiveness of Traditional Training Methods in Non-Traditional Training Programs for Adult Learners through a Pre-test/Post-test Comparison of Food Safety Knowledge

Caleb D. Dodd
Scott Burris
Steve Fraze
David Doerfert
Abigail McCulloch
Texas Tech University

The incorporation of hot and cold food bars into grocery stores in an effort to capture a portion of the home meal replacement industry is presenting new challenges for retail food establishments. To ensure retail success and customer safety, employees need to be educated in food safety practices. Traditional methods of training are not meeting the needs of the retail food industry. Although many food safety training programs exist, few meet the educational needs of hot and cold food bar employees. In an effort to determine the effectiveness of traditional training methods for employees, a quasi-experimental study was performed. Data was collected from three separate chains within the retail food industry from six geographical locations. The pre-post assessment study utilized an interventional training and included collecting questionnaires from 300 employees. Findings of the study described characteristics of employees within each chain individually and collectively. Food safety knowledge was assessed by comparing pre-training and post-training assessments for managerial and non-managerial employees. The most important finding for this study was determining the change in essential food safety knowledge of employees after traditional food safety training was conducted for managerial employees within the treatment stores and comparing that change to the change that occurred in the control groups.

Keywords: Non-traditional training; food safety; training effectiveness; adult training.

The retail food industry is rapidly changing with new trends and practices emerging constantly (Bolton, Shankar, & Montoya, 2010). Throughout the past decade, Home Meal Replacement (HMR) has developed into a leading trend in the food service and grocery industries (Quested, Cook, Gorris, & Cole, 2010). Food-service operations are competing with grocery stores for the traditional food market (Friddle, Mangaraj, & Kinsey, 2001). With the HMR trend taking over the industry, grocery stores are striving to maintain their traditional hold on the food market by developing ready-to-eat hot and cold self-service food bars (Binkley & Ghiselli, 2005).

With the addition of new products, kitchens, and procedures comes additional food safety concerns (Friddle et al., 2001). These concerns lead to a need to incorporate food safety training for the new procedures. In order to provide safe food, employees need to know how to properly prepare and maintain food for hot and cold food bars and be trained to properly use kitchen tools and equipment (McCulloch, 2009). This new market opportunity presents a need for training to ensure proper food safety practices in the hot and cold food bars within the grocery store industry.

An organized approach is necessary to identify and fulfill training needs. In 2006, organizations spent $129.6 billion dollars on training to
prepare employees for conducting their tasks. With such a sizable investment, organizations must prioritize and focus training resources where they will be most effective (Moskowitz, 2008). One way of providing this focus is through the utilization of a needs assessment. A needs assessment is the process of identifying needs, prioritizing them, making needs-based decisions, allocating resources, and implementing actions in organizations to resolve problems underlying important needs (Altschuld & Kumar, 2010). Moskowitz (2008) found that the most efficient way to collect data for a training needs assessment is through surveys. However, employee behavior can also be observed in the working environment to provide usable data for the assessment. In addition, tests can be administered to employees to assess job knowledge (Moskowitz, 2008).

There are many methods for conducting a needs assessment. In 1984, Witkin developed a process model that contained three phases and emphasized three levels of need (Altschuld & Kumar, 2010). Since then, Altschuld and Kumar (2010) have revised the model.

Phase I of the needs assessment model consists of becoming organized and focusing on potential areas of concern. This includes exploring literature and research to determine what is already available and its level of success as it relates to the specified focus of each employer. Phase I is a critical building block of a needs assessment as it leads to a wealth of information about the areas of concern. The purpose of this phase is to take advantage of existing data (Altschuld & Kumar, 2010). Previous literature of training strategies and programs within the grocery industry was researched to complete Phase I of the needs assessment.

Phase II deals with gathering new information based on what has not been discovered in Phase I. Phase II involves determining initial needs, prioritizing these needs, and analyzing their possible solution strategies. Phase II often requires an extensive investment of time, personnel, and resources for the collection of new data (Altschuld & Kumar, 2010). A pretest/post-test study was conducted to create a wealth of new data to complete Phase II of the needs assessment.

Designing and implementing solutions for high-priority needs and evaluating the results of the needs assessment process constitute Phase III. Evaluation of the process generally is not done but should be completed as part of organizational development and change (Altschuld & Kumar, 2010). Recommendations were made for future training programs to complete Phase III of the needs assessment.

Despite the success, there have been many challenges for grocery stores that serve HMRs, including time, labor, and food safety risks. The intricate food structure, employee turnover, and food pathogens are hampering the safety efforts that supermarkets utilize in the United States (Binkley & Ghiselli, 2005). Even if perfect production and distribution practices are followed, consumers may not follow safe-handling procedures (Reyes, 2002). This knowledge combined with the fact that many grocery stores are adding kitchens and unfamiliar equipment and processes to their businesses forces grocery stores to be more focused on food safety practices and train their employees to handle food safely (Binkley & Ghiselli, 2005).

Effective food safety plans and well-trained staff can help prevent an unwanted outbreak of foodborne illness. As the complexity of the food distribution and retailing system increases, the need for more stringent food safety controls and training increases as well. Food safety training and certification are a crucial part of any food safety plan (Drummer, 1998). Implementing an effective food safety training program for employees, applying a sanitation program, and designing a crisis plan in the case of a foodborne illness outbreak are evident needs in the HMR market (Binkley & Ghiselli, 2005).

There are many barriers to implementing effective food safety training for employees. A small staff base, employee turnover, lack of time, cost, a lack of suitable courses, and inflexibility of courses were reported as the most common barriers when attempting to provide effective training for supermarket employees (Worsfold, 2005). Some researchers suggest that food safety training is effective, but others find no improvement in food safety practices after training employees (York et al., 2009).

Worsfold (2005) found that effective training did not appear to be on the agenda of priori-
ties for many food managers. Some managers in the study viewed training as an operating expense and did not realize the benefits. Due to low cost and convenience, on-the-job training was the most common type of training within the food service industry (Worsfold, 2005). This type of training can produce negative results including poorly trained employees who use dangerous or ineffective methods to produce food products (Worsfold, 2005).

**Purpose and Objectives**

The purpose of this study was to determine the effectiveness of commonly used training methods within a non-traditional learning program. Food safety is a major concern that is continually faced by grocery stores and other food providers (Binkley & Ghiselli, 2005). Food workers’ improper preparation procedures are the most prominent cause of foodborne illness outbreaks (Foodborne Illness, 2010). Effective training is needed to allow for grocery store employees to prepare and serve food in a manner that is safe and foodborne illness free.

This study is directly related to the fourth (Examine appropriate non-formal educational delivery systems) and fifth (Identify and use evaluation systems to assess program impact) research priority areas of Agricultural Education in Domestic and International Settings: Extension and Outreach of the National Research Agenda for Agricultural Education and Communication. In order to successfully complete this study, objectives were determined to identify the effectiveness of traditional training methods within stores by transferring knowledge from managerial employees to non-managerial employees. This needs assessment was guided by two research objectives:

1. Describe characteristics of managerial and non-managerial individuals employed within the hot and cold self-service food bars of grocery stores.
2. Assess the change in food safety knowledge of stores between pre-assessment and post-assessment.

**Methods and Procedures**

The research design for this study was quasi-experimental. This type of experiment lacks random assignment but can yield useful knowledge if it is carefully designed (Gall, Gall, & Borg, 2007). The study contained an education intervention. Initial assessment was pre-test, followed by a traditional food safety training program, then followed by a post-test assessment. The effectiveness of the training program and the transfer of information from managerial employees to non-managerial employees were determined through differences in the pre-training questionnaires and post-training questionnaires.

With the intention of developing a computer-based training program for hot and cold self-service food bars in the grocery store industry, the United States Department of Agriculture (USDA) funded a research grant through the International Center for Food Industry Excellence (ICFIE). Three grocery chain retail food providers agreed to participate in the collaborative project. The chains span six geographical regions within five states. In order to properly assess the effectiveness of food safety training it was determined that both managerial and non-managerial employees should be included in the study. The target population included employees that worked in the hot and cold self-serve food bar department of grocery stores. The sampling technique used for this study was non-probabilistic purposive.

The grocery chains agreed to allow one managerial employee and two non-managerial employees to complete a written questionnaire. Following the initial data collection period, managerial employees from randomly selected stores participated in an interventional food safety training program presented in a traditional classroom method. The stores not selected were identified as a control group, while the stores participating in the training were identified as the treatment group. The interventional food safety training the managerial employees received was presented by professionals using certification curriculum. Post-training data was collected no less than 30 days later, this period of time gave managerial employees time to transfer new knowledge to non-managerial em-
ployees within the stores. Post-training data included the same questionnaire, again targeting one managerial employee and two non-managerial employees. After the collection of the data, analysis was performed to identify what effects the training had on the stores’ food safety knowledge collectively.

The accessible sample for the needs assessment consisted of 44 stores from three grocery chains in five states who offered hot and cold self-service food bars for customers. The 44 stores were represented by 300 questionnaires. Fifty-six managerial employees and 113 non-managerial employees participated in the pre-assessment of food safety knowledge, whereas 43 managerial employees and 88 non-managerial employees participated in the post-training questionnaire. The sampling technique was non-probabilistic. Results of this study cannot be generalized to a larger population due to the fact that the sample was purposively selected by the chains upper management. However, the sampling technique does allow for adequate needs assessment to be performed.

The instrument used for this study was a Food Safety Questionnaire developed for a pre-assessment to develop a food safety training program (McCulloch, 2009). The questionnaire consisted of five sections. The questionnaire was developed in both English and Spanish. As reported by McCulloch, the content and validity of the instrument used for this study was established by a panel of experts. McCulloch reported the Kuder-Richardson 20 coefficient was 0.51. This is relatively low, but acceptable value for the Kuder-Richardson (Nunnally, 1967).

Two different modes were used for collecting data from employees. An online instrument was initially developed for the delivery of the questionnaire; a paper booklet was then designed to accommodate individuals without access to internet connections. The collection of pre-test and post-test data spanned 15 months. The study was designed to offset data collection between chains to reduce the number of personnel used data collection. Data from each chain was collected within a 200-day period.

Data was entered and analyzed using the Statistical Package for Social Sciences (SPSS) 16.0 computer program for Microsoft Windows. Microsoft Excel 2007 was used for calculating scores. Descriptive data for objective one was reported using frequencies, percentages, means, and standard deviations. In analyzing data for objective two, 16 questions from section two of the questionnaire were used to determine food safety knowledge scores. Each participant received a percentage score representing the number of questions the individual answered correctly out of the 16 possible. Objective two assessed the change between pre-training food safety knowledge and post-training food safety knowledge of employees.

Findings

Managerial employees’ data were analyzed separately from non-managerial employee data as statistical comparison between the two groups were not suitable. The findings are presented by each chain individually and from all stores cumulatively. Table 1 provides a summary of the number of participants by chain for each phase of data collection.
Objective one sought to describe the employees participating in the study. This section described the demographic characteristics of the participants along with their retail food experience and experiences in food safety training. The average age of the participants and their average number of years in the retail food industry are presented in Table 2. The mean age of managerial employees in the study was 39 (SD=9.2) while non-managerial employees’ average age was slightly younger (M=38) with a higher level of variance (SD=13.8). The average number of years in the industry for managerial employees was 10 years (SD=7.0). The average for non-managerial employees in the retail food industry was six years (SD=6.2).

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Chain I</th>
<th>Chain II</th>
<th>Chain III</th>
<th>Grand Mean</th>
</tr>
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<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>M</td>
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</tr>
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<tr>
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<td>11</td>
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<tr>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>39</td>
<td>16.4</td>
<td>36</td>
<td>12.7</td>
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<tr>
<td>Years in Industry</td>
<td>5</td>
<td>6.1</td>
<td>6</td>
<td>6.7</td>
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</table>
Gender, current positions held, and levels of education for the managerial employees are reported in the Table 3. Just over half the managerial employees were female \((n=50)\). Fifty-five percent \((n=55)\) of managerial employees in the study reported being their stores’ department manager. The level of education of the managerial employees varied from 21.2\% of participants \((n=21)\) reporting having some high school to 11.1\% of participants \((n=11)\) having earned a bachelor’s degree. Almost half of the managerial employees reported either a high school diploma or some high school being their highest level of education.

Table 3
Managerial Employees’ Gender, Position, and Education Level

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Chain I</th>
<th></th>
<th>Chain II</th>
<th></th>
<th>Chain III</th>
<th></th>
<th>Cumulative</th>
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<td></td>
<td>(f)</td>
<td>%</td>
<td>(f)</td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>Female</td>
<td>14</td>
<td>46.7</td>
<td>26</td>
<td>65.0</td>
<td>10</td>
<td>34.5</td>
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<td>50.5</td>
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<tr>
<td>Male</td>
<td>13</td>
<td>43.3</td>
<td>14</td>
<td>35.0</td>
<td>18</td>
<td>62.1</td>
<td>45</td>
<td>45.5</td>
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<tr>
<td>Undisclosed</td>
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<td>10.0</td>
<td>0</td>
<td>0.0</td>
<td>1</td>
<td>3.4</td>
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<td></td>
<td></td>
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<tr>
<td>Department Manager</td>
<td>19</td>
<td>63.3</td>
<td>22</td>
<td>55.0</td>
<td>14</td>
<td>48.3</td>
<td>55</td>
<td>55.6</td>
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<tr>
<td>Department Head</td>
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<td>6.7</td>
<td>4</td>
<td>10.0</td>
<td>5</td>
<td>17.2</td>
<td>11</td>
<td>11.1</td>
</tr>
<tr>
<td>Co-Manager</td>
<td>3</td>
<td>10.0</td>
<td>2</td>
<td>5.0</td>
<td>2</td>
<td>6.9</td>
<td>7</td>
<td>7.1</td>
</tr>
<tr>
<td>Other title</td>
<td>6</td>
<td>20.0</td>
<td>12</td>
<td>30.0</td>
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<td>27.6</td>
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<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Some High School</td>
<td>10</td>
<td>33.3</td>
<td>9</td>
<td>22.5</td>
<td>2</td>
<td>6.9</td>
<td>21</td>
<td>21.2</td>
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<td>High School Diploma</td>
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<td>16.7</td>
<td>12</td>
<td>30.0</td>
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<td>27.7</td>
<td>25</td>
<td>25.3</td>
</tr>
<tr>
<td>Some Culinary/Tech</td>
<td>6</td>
<td>20.0</td>
<td>3</td>
<td>7.5</td>
<td>4</td>
<td>13.8</td>
<td>13</td>
<td>13.1</td>
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<td>6.7</td>
<td>4</td>
<td>10.0</td>
<td>1</td>
<td>3.4</td>
<td>7</td>
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<tr>
<td>Associate’s Degree</td>
<td>5</td>
<td>16.6</td>
<td>6</td>
<td>15.0</td>
<td>11</td>
<td>37.9</td>
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<td>22.2</td>
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<td>Bachelor’s Degree</td>
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<td>15.0</td>
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<td>10.3</td>
<td>11</td>
<td>11.1</td>
</tr>
</tbody>
</table>

The same information provided for managerial employees in Table 3 was provided for non-managerial employees in the study in Table 4. Unlike the managerial employees, who were relatively even in the female-to-male ratio, females accounted for 68.1\% \((n=137)\) of all the non-managerial employees participating in the study. Although 21.4\% \((n=43)\) of the non-managerial employees reported holding positions with titles, the vast majority, 78.6\% \((n=158)\) reported being an hourly employee or some other title. The level of education did fluctuate from percentages reported by managerial employees. However, the most frequent responses remained the same with 65 (32.3\%) of the non-managerial employees reporting a high school diploma as the highest level of education and some high school accounting for 28.9\% \((n=58)\).
Table 4
Non-managerial Employees’ Gender, Position, and Education Level

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Chain I</th>
<th>Chain II</th>
<th>Chain III</th>
<th>Cumulative</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>f</td>
<td>%</td>
<td>f</td>
<td>%</td>
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<tr>
<td>Gender</td>
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<td>52</td>
<td>67.5</td>
<td>46</td>
<td>68.7</td>
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<tr>
<td>Male</td>
<td>20</td>
<td>26.0</td>
<td>20</td>
<td>29.9</td>
</tr>
<tr>
<td>Undisclosed</td>
<td>5</td>
<td>6.5</td>
<td>1</td>
<td>1.5</td>
</tr>
<tr>
<td>Position</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shift Leader</td>
<td>3</td>
<td>3.9</td>
<td>12</td>
<td>17.9</td>
</tr>
<tr>
<td>Department Head</td>
<td>2</td>
<td>2.6</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>Assistant Head</td>
<td>5</td>
<td>6.5</td>
<td>8</td>
<td>11.9</td>
</tr>
<tr>
<td>Hourly Employee</td>
<td>61</td>
<td>79.2</td>
<td>44</td>
<td>65.7</td>
</tr>
<tr>
<td>Other title</td>
<td>6</td>
<td>7.8</td>
<td>3</td>
<td>4.5</td>
</tr>
<tr>
<td>Education</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Some High School</td>
<td>27</td>
<td>35.0</td>
<td>18</td>
<td>26.9</td>
</tr>
<tr>
<td>High School Diploma</td>
<td>23</td>
<td>29.9</td>
<td>26</td>
<td>38.8</td>
</tr>
<tr>
<td>Some Culinary/Tech</td>
<td>15</td>
<td>19.5</td>
<td>10</td>
<td>14.9</td>
</tr>
<tr>
<td>Graduate Culinary/Tech</td>
<td>3</td>
<td>3.9</td>
<td>3</td>
<td>4.5</td>
</tr>
</tbody>
</table>

Methods of training received and time spent training for managerial employees are displayed in Table 5. When responding to methods of training received, participants were encouraged to answer all that applied to their individual experience.

Table 5
Managerial Employees’ Experience with Food Safety Training

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Chain I</th>
<th>Chain II</th>
<th>Chain III</th>
<th>Cumulative</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>f</td>
<td>%</td>
<td>f</td>
<td>%</td>
</tr>
<tr>
<td>Method of Training</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Classroom</td>
<td>17</td>
<td>56.8</td>
<td>39</td>
<td>97.5</td>
</tr>
<tr>
<td>On-the-job</td>
<td>20</td>
<td>66.7</td>
<td>15</td>
<td>37.5</td>
</tr>
<tr>
<td>Textbook</td>
<td>8</td>
<td>26.7</td>
<td>11</td>
<td>27.5</td>
</tr>
<tr>
<td>Video</td>
<td>9</td>
<td>30.0</td>
<td>15</td>
<td>37.5</td>
</tr>
<tr>
<td>Computer-based</td>
<td>24</td>
<td>80.0</td>
<td>2</td>
<td>5.0</td>
</tr>
<tr>
<td>Company-web</td>
<td>10</td>
<td>33.3</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>Internet</td>
<td>6</td>
<td>20.0</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>Time Spent Training</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>More than 3 days</td>
<td>12</td>
<td>40.0</td>
<td>4</td>
<td>10.0</td>
</tr>
<tr>
<td>2 – 3 days</td>
<td>7</td>
<td>23.3</td>
<td>24</td>
<td>60.0</td>
</tr>
<tr>
<td>1 day</td>
<td>3</td>
<td>10.0</td>
<td>2</td>
<td>5.0</td>
</tr>
<tr>
<td>6 – 12 hours</td>
<td>3</td>
<td>10.0</td>
<td>6</td>
<td>15.0</td>
</tr>
<tr>
<td>Less than 5 hours</td>
<td>5</td>
<td>16.7</td>
<td>4</td>
<td>10.0</td>
</tr>
</tbody>
</table>

Classroom training, accounting for 82.8% (n=82), was the most common method reported by managerial employees. It was also the most frequent response in two of the three chains. Eighty percent of managerial employees (n=24) in Chain I reported computer-based training to be most prominent. Only two managerial employees (5.0%) in Chain II and three managerial employees (10.3%) in Chain III re-
reported utilizing computer-based training. Although city and state certification appeared to be the most popular training certification with 48.8% \((n=49)\), it was less than half of the most frequent response in two of the three chains. Fifty-two managerial employees (52.5%) reported spending between two and three days in food safety training. Two to three days training was also the majority in Chain II and Chain III; however, 40% \((n=12)\) of managerial employees in Chain I reported spending more than three days in food safety training. Methods of training and time spent training for non-managerial employees are described in Table 6.

Table 6

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Chain I</th>
<th>Chain II</th>
<th>Chain III</th>
<th>Cumulative</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(F)</td>
<td>(%)</td>
<td>(f)</td>
<td>(%)</td>
</tr>
<tr>
<td>Method of Training</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Classroom</td>
<td>13</td>
<td>16.9</td>
<td>51</td>
<td>76.1</td>
</tr>
<tr>
<td>On-the-job</td>
<td>53</td>
<td>68.8</td>
<td>44</td>
<td>65.7</td>
</tr>
<tr>
<td>Textbook</td>
<td>15</td>
<td>19.5</td>
<td>11</td>
<td>16.4</td>
</tr>
<tr>
<td>Video</td>
<td>34</td>
<td>44.2</td>
<td>25</td>
<td>37.3</td>
</tr>
<tr>
<td>Computer-based</td>
<td>46</td>
<td>59.7</td>
<td>1</td>
<td>1.5</td>
</tr>
<tr>
<td>Company-web</td>
<td>13</td>
<td>16.9</td>
<td>1</td>
<td>1.5</td>
</tr>
<tr>
<td>Internet</td>
<td>3</td>
<td>3.9</td>
<td>2</td>
<td>3.0</td>
</tr>
<tr>
<td>Time Spent Training</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>More than 3 days</td>
<td>12</td>
<td>15.6</td>
<td>7</td>
<td>10.4</td>
</tr>
<tr>
<td>2 – 3 days</td>
<td>11</td>
<td>14.3</td>
<td>22</td>
<td>32.8</td>
</tr>
<tr>
<td>1 day</td>
<td>14</td>
<td>18.2</td>
<td>11</td>
<td>16.4</td>
</tr>
<tr>
<td>6 – 12 hours</td>
<td>2</td>
<td>2.6</td>
<td>7</td>
<td>10.4</td>
</tr>
<tr>
<td>Less than 5 hours</td>
<td>38</td>
<td>49.3</td>
<td>20</td>
<td>30.0</td>
</tr>
</tbody>
</table>

Unlike the responses given by the managerial employees, the method of training most frequently used, as reported by non-managerial employees, was on-the-job training by 67.2% \((n=135)\). Chain II and Chain III aligned more closely to the numbers reported by managerial employees. The most frequent method of training for these chains was classroom training by 76.1% \((n=51)\) for Chain II and 70.2% \((n=40)\) for Chain III. At 59.7% \((n=46)\), more than half of Chain I non-managerial employees reported participating in computer-based training. Like managerial employees from Chain II and Chain III, only one non-managerial employee from Chain II (1.5%) and 12 non-managerial employees from Chain III (21.1%) reported using computer-based training. The amount of time spent training also differed from responses given by managerial employees. The most frequent response given by non-managerial employees was less than five hours with 33.3% \((n=67)\). Two to three days was the second most frequent overall and the most frequent in Chain II with 32.8% \((n=22)\) and Chain III with 42.1% \((n=24)\).

Objective two assessed the change in food safety knowledge of employees from the pre-assessment to the post-assessment. Food safety knowledge was assessed through 16 multiple choice items developed specifically to test the essential knowledge of employees within the hot and cold self-service food bar sectors of grocery stores. Each participant was given a score based on the percentage of items they answered correctly out of the 16 questions. Scores were averaged among the control groups and treatment groups for both pre-training and post-training assessments for each chain individually and cumulatively. Changes in scores were calculated for each category of participants.

The difference in percentage scores were used for comparing and identifying changes between pre-training and post-training performance. There are many different levels of pre-training food safety knowledge scores reported in this section. Knowledge scores that are high in the pre-training assessment do not leave as large of a window for improvement to occur. Identifying the changes in scores allowed
The food safety knowledge scores for managerial employees are reported in Table 7. The scores are reported as an average of the percentage of correct answers of all the managerial employees in each category identified in the study. The difference in the pre-training and post-training scores represents the change in food safety knowledge that occurred over time between the collections of the data. The control group received no additional treatment between the assessments of knowledge, whereas managerial employees in the treatment group participated in interventional training for food safety.

### Table 7

**Change in Food Safety Knowledge Scores for Managerial Employees**

<table>
<thead>
<tr>
<th>Knowledge</th>
<th>Chain I</th>
<th>Chain II</th>
<th>Chain III</th>
<th>Cumulative</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>C</td>
<td>T</td>
<td>C</td>
<td>T</td>
</tr>
<tr>
<td>Pre-Training</td>
<td>68.8</td>
<td>68.0</td>
<td>81.3</td>
<td>81.3</td>
</tr>
<tr>
<td>Post-Training</td>
<td>70.8</td>
<td>75.0</td>
<td>79.2</td>
<td>81.3</td>
</tr>
<tr>
<td>Difference in Scores</td>
<td>2.0</td>
<td>7.0</td>
<td>(2.1)</td>
<td>(2.5)</td>
</tr>
</tbody>
</table>

Note. C=Control Group, T=Treatment Group

Cumulatively, the control group had lower pre-training (71.3%) and post-training (75.9%) scores than the treatment group (74.8%, 79.3%). However, the difference in the amount of change that occurred over time between both groups was one-tenth of a percent. Chain I’s pre-training scores were extremely close (68.8%, 68.0%), but a 7.0% increase occurred in the treatment group as opposed to the 2.0% increase that was seen in the control group between the pre-training and post-training assessments of knowledge. Chain II had the highest scores by far on the assessment prior to training with the control group scoring 81.3% and the treatment group scoring 83.8%. Chain II also had a negative change in knowledge with both groups dropping in their average scores by 2.1% (control) and 2.5% (treatment). Although Chain II had a decrease in scores, the percentage of correct answers on the post-training assessment remained the top scores represented in the data (79.2%, 81.3%). Chain III’s control group started with the lowest score of 65.6%, but had the largest change of 11.0%. Chain III’s treatment group also had an increase in knowledge from 70.9% (pre-training) to 81.3% (post-training) for a change of 10.4%.

The food safety knowledge scores for non-managerial employees are reported in Table 8. The difference in the pre-training and post-training scores represents the change in food safety knowledge that occurred over time between the collections of the data. The managerial employees in the control group received no additional treatment between the assessments of knowledge; whereas, the managerial employees in the treatment group participated in interventional food safety training. Non-managerial employees received no additional training.

### Table 8

**Change in Food Safety Knowledge Scores for Non-managerial Employees**

<table>
<thead>
<tr>
<th>Knowledge</th>
<th>Chain I</th>
<th>Chain II</th>
<th>Chain III</th>
<th>Cumulative</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>C</td>
<td>T</td>
<td>C</td>
<td>T</td>
</tr>
<tr>
<td>Pre-Training</td>
<td>62.8</td>
<td>59.0</td>
<td>75.0</td>
<td>71.5</td>
</tr>
<tr>
<td>Post-Training</td>
<td>67.8</td>
<td>66.5</td>
<td>68.0</td>
<td>65.3</td>
</tr>
<tr>
<td>Difference in Scores</td>
<td>5.0</td>
<td>7.5</td>
<td>(7.0)</td>
<td>(6.2)</td>
</tr>
</tbody>
</table>

Note. C=Control Group, T=Treatment Group
The average knowledge scores for non-managerial employees were lower than the scores reported for managerial employees across the board. Cumulatively, the non-managerial employees pre-training scores were 67.2% for the control group and 62.5% for the treatment group. A slight decrease of 0.8% was scored on the post-training score in the control group with a slight increase of 1.7% occurring in the treatment group. Chain I was only 0.2% away from having the lowest scores on the pre-training assessment and only 0.2% away from having the highest scores on the post-training assessment. Chain I had the greatest amount of change for both the control group (5.0%) and the treatment group (7.5%). Chain II had the highest scores on the pre-training assessment (75.0%, 71.5%) but, like the managerial employees, also showed the greatest decrease in knowledge scores (7.0%, 6.2%). Even with the decrease in knowledge scores, the non-managerial employees in Chain II had some of the highest scores recorded in the post-training assessment. Chain III’s non-managerial employees showed the least amount of change from pre-training to post-training assessments. The control group’s score decreased 2.1% while the treatment group’s score increased by 1.3%.

A comparison of food safety knowledge percentage scores between managerial and non-managerial employees was conducted to assess the difference in food safety knowledge between the two groups. The pre-training and post-training food safety knowledge percentage scores are displayed in Table 9.

<table>
<thead>
<tr>
<th>Knowledge</th>
<th>Chain I</th>
<th>Chain II</th>
<th>Chain III</th>
<th>Grand Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>C</td>
<td>T</td>
<td>C</td>
<td>T</td>
</tr>
<tr>
<td>Pre-Training</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Managerial</td>
<td>68.8</td>
<td>68.0</td>
<td>81.3</td>
<td>83.8</td>
</tr>
<tr>
<td>Non-managerial</td>
<td>62.8</td>
<td>59.0</td>
<td>75.0</td>
<td>71.5</td>
</tr>
<tr>
<td>Difference</td>
<td>6.0</td>
<td>9.0</td>
<td>6.3</td>
<td>12.3</td>
</tr>
<tr>
<td>Post-Training</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Managerial</td>
<td>70.8</td>
<td>75.0</td>
<td>79.2</td>
<td>81.3</td>
</tr>
<tr>
<td>Non-managerial</td>
<td>67.8</td>
<td>66.5</td>
<td>68.0</td>
<td>65.3</td>
</tr>
<tr>
<td>Difference</td>
<td>3.0</td>
<td>8.5</td>
<td>11.2</td>
<td>16.0</td>
</tr>
</tbody>
</table>

*Note. C=Control Group, T=Treatment Group*

The average scores for managerial employees in every chain was consistently higher that the non-managerial employees’ scores. In the pre-training, Chain II had the highest scores for both managerial and non-managerial employees, but also had the largest difference in scores with 6.3% in the control group and 12.3% in the treatment group. The difference in food safety knowledge scores was consistently larger in the treatment groups for the pre-training assessment. The difference of food safety knowledge scores between the managerial and non-managerial employees grew larger in every group except Chain I’s control group from the pre-training to the post-training. The gap of knowledge grew the largest in Chain III. The control group had a 2.1% difference in the pre-training and a 15.7% difference in the post-training while the treatment group went from a 12.1% difference in the pre-training to a 21.2% difference in the post-training. The overall increase in the difference in food safety knowledge scores between the managerial and non-managerial employees was 5.4% (control) and 2.8% (treatment).
Conclusions, Implications and Recommendations

The employees in this study reported a similar average age. This is most likely due to the high population of high school students mixed with the growing number of baby boomers reaching retirement age and taking part-time employment in the retail food service industry to supplement retirement funds. Managerial employees had almost twice as many years of experience in the industry than did non-managerial employees. This represents two important aspects. First, time in the industry is an important factor for promotion and career success within the industry. Second, non-managerial employees who stay in the industry for an extended period of time are likely to move into management positions. Because non-managerial employees are the ones who move into the management positions, training should be focused on all employees, not only managerial employees.

Most managerial employees in the study held positions with titles and reported a variety of educational levels from some who had only attended some high school to others who had earned bachelor degrees. The majority of non-managerial employees were on hourly employment with over 60% reporting either a high school diploma or some high school. There is a large intellectual range of participants targeted for food safety training. This finding is consistent with findings from McCulloch (2009). Over half of all the employees who participated in the study reported their highest level of education to be a high school diploma or some high school. Based on this finding, food safety training should target a junior high reading level.

Trends for methods of training and time spent training between managerial and non-managerial employees showed some similarities. Employees are accustomed to classroom and on-the-job training between two and three days. This supports findings by Kramer and Scott (2004), Worsfold (2005), and York et al., (2009). Based on results of food safety knowledge scores and number of non-managerial employees who only reported receiving on the job training, researchers can conclude that the current methods of training are not meeting the needs of the hot and cold self-service food bars, therefore, a more effective method for training employees in the retail food industry is needed.

Food safety knowledge scores prior to the interventional training were compared to the food safety knowledge scores following the training to assess the effects the interventional training had on employees’ food safety knowledge. The average food safety knowledge scores for employees in the post-training assessment for the treatment groups were lower than one might expect on an assessment of essential knowledge. This finding was consistent with the results of other food safety studies conducted by Hertzman and Barrash (2007) within other regions of the retail food industry. Managerial employees’ scores resulted in a 79% average, and carried into a 64% average for their non-managerial employees. The method of transferring knowledge to employees does not sufficiently educate participants in food safety knowledge that is necessary to ensuring food safety for hot and cold self-serve food bar sectors of grocery stores.

The average scores for the three chains cumulatively did not exhibit a large variance between the control group and the treatment group from pre-training to post-training. Managerial employees’ difference was less than a tenth of a point and non-managerial employees’ resulted in a difference of two and a half percentage points. Overall, the control groups showed a similar change in food safety knowledge as the treatment groups in the study. The traditional method of food safety training did not appear to effectively meet the educational needs of employees in the hot and cold food bars.

In addition, following the training the difference in food safety knowledge between managerial and non-managerial employees grew larger. Managerial employees were the only ones to receive the interventional training with expectations of taking the information back to the non-managerial employees. Information from the interventional training did not appear to have been distributed from the managerial employees to the non-managerial employees in an effective manner. Traditional methods of “training the trainer,” expecting information to filter down, does not meet the educational needs within the
hot and cold self-service food bar to ensure safe food for consumers.

Food safety knowledge within the grocery store industry is not at an appropriate level to meet the needs of food safety standards. McCulloch (2009) recommended that the most common methods of training, classroom and on-the-job training, be utilized to build these scores. Researchers in this study do not see these methods meeting the need and recommend that a more effective style of training be explored to promote the retention of understanding of the concepts and importance of food safety in hot and cold food self-service food bars of grocery stores.

Palvia and Palvia (2007) found that all methods of computer-based instruction led to an improvement in the skills of the participants. Macaulay and Pantazi (2006) discovered that students who used computer-based training scored significantly higher than those who used traditional methods. Van Gerven, Paas, and Tabbers (2006) found that computer-based training plays an important role in optimizing the level of cognitive load an individual is capable of processing. Based on findings of this study, computer-based curriculum will be a new method for more than half of participants.

This study identified a flaw in the traditional method of training employees in the hot and cold food bars utilizing food safety training developed for grocery stores as a whole. The study also found that managerial employees’ food safety knowledge is not effectively distributed to their non-managerial employees. All employees who work in any aspect of the hot and cold self-service food bars within the grocery stores should be required to participate in additional food safety training that focuses specifically on issues relating to hot and cold food bar food safety.

References


CALEB D. DODD was an Agricultural Education Graduate Student in the Department of Agricultural Education and Communications at Texas Tech University, Box 42131, Lubbock, TX 79404-2131, caleb-dodd@hotmail.com.

SCOTT BURRIS, Ph.D. is an Associate Professor of Agricultural Education in the Department of Agricultural Education and Communications at Texas Tech University, Box 42131, Lubbock, TX 79404-2131, scott.burris@ttu.edu.

STEVE FRAZE, Ph.D. is the Chair of the Department of Agricultural Education and Communications at Texas Tech University, Box 42131, Lubbock, TX 79404-2131, steve.fraze@ttu.edu.

DAVID DOERFERT, Ph.D. is a Professor for Agricultural Education and the Graduate Studies Coordinator in the Department of Agricultural Education and Communications at Texas Tech University, Box 42131, Lubbock, TX 79404-2131, david.doerfert@ttu.edu.

ABIGAIL MCCULLOCH was an Agricultural Education Graduate Student in the Department of Agricultural Education and Communications at Texas Tech University; she is currently an Agriculture Educator and Advisor at Cleburne High School, 1501 North Harland Drive, Cleburne, TX, 76033, abigail.mcculloch@cleburne.k12.tx.us.

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Student Motivation for Involvement in Supervised Agricultural Experiences: An Historical Perspective

William A. Bird  
*University of Nebraska-Lincoln*  
Michael J. Martin  
Jon C. Simonsen  
*University of Missouri*

The purpose of this study was to examine student motivation for SAEs through the lens of the Self-Determination Theory. Self-Determination Theory proposed that human beings are more genuinely motivated when driven by internal factors as opposed to external factors. We used historical research and general qualitative interpretative methods to develop an explanation of student motivation for SAEs. We examined historical magazines, documents, and books for detailed cases of SAE participation. Three specific time periods were examined: 1928-1934, 1947-1953, and 1966-1973. We found that student motivation for SAEs has been a prevailing topic since the 1920s. SAEs have typically been initiated by utilizing extrinsic motivating forces through mandating, awards, class requirements, or collaborative school projects. Although extrinsic motivation was not ideal, half of the cases studied ended with a developed internal locus of causality. This demonstrated that student motivation to participate in SAEs could be established by external motivators and later sustained by internal stimulus. We recommend that agricultural education practitioners use caution when assigning external rewards. Overuse of external rewards such as money, trophies, or recognition could potentially distort a student’s acquisition of the “true” SAE values of enhanced learning and career exploration.

Supervised agricultural experiences (SAEs) are intended to be an experiential learning tool for students enrolled in school-based agricultural education programs. SAEs constitute one-third of the agricultural education model and are critical to the mission of agricultural education (Moore, 1988; Phipps, Osborne, Dyer, & Ball, 2008). Through SAEs, students apply concepts learned in the classroom to real world applications (Dyer & Osborne, 1995; Dyer & Williams, 1997; Phipps et al., 2008; Talbert, Vaughn, & Croom, 2005). Agriculture teachers value the concept of SAEs but often fail to successfully implement SAEs within their programs (Dyer & Osborne, 1995; Retallick, 2010). Furthermore, student participation in SAEs has consistently declined throughout the past few decades (Dyer & Osborne, 1995; Retallick & Martin, 2005; Steele, 1997). However, the reasons for declining student participation in SAEs have not been well examined. Considering the long history and purported value of SAEs, an examination of students’ motivation over the years for SAE participation could help educators understand the trend of declining SAE participation.

Student participation in SAEs has historically been a concern of agricultural educators. To address this problem, agricultural education professionals have required agriculture students to engage in a SAE. During the early years of the agricultural education profession, federal and state governing agencies mandated student participation in SAEs (Moore, 2003; Wilson & Moore, 2007). Though SAEs are no longer federally mandated, many teachers require all students to have a SAE or maintain SAE records as a component of the curriculum (Dyer & Osborne, 1995; Retallick, 2010). Although the teacher’s intentions of requiring student SAE participation may be well intended, research in-
dicates that students can potentially develop negative attitudes towards SAEs if they are perceived as just a requirement (Schunk, Pintrich, & Meece, 2008).

Researchers have suggested declining SAE involvement is partly attributed to a lack of student motivation for SAE participation (Dyer & Osborne, 1995; Osborne, 1988). The National FFA Organization (FFA) has provided awards to stimulate student interest and participation in SAEs. By the 1940s, B. L. Bible (1941) described how the FFA degree system motivated students’ participation in SAEs. “The opportunity for degree advancement provides the single strongest drive for the boy to develop a strong supervised farm practice program…. if he works hard enough to build a record of scholarship and leadership and a long-time farming program” (p. 117). Teachers still attempt to stimulate and maintain student participation in SAEs using FFA Proficiency Award, FFA Degrees, and American Star Award programs (Bender, Taylor, Hansen, & Newcomb, 1979; National FFA Organization, 2012; Retallick, 2010; Tenney, 1977; Wilson & Moore, 2007).

However, current motivational theories suggest that excessive extrinsic awards are not always an effective strategy to motivate students (Deci & Ryan, 1985a; Schunk, 2009).

Agricultural education professionals have utilized mandates and awards to stimulate and motivate student participation in SAEs. However, the problem may not be a lack of motivation—the problem could be a lack of effective motivational strategies. Existing research related to SAEs has primarily focused on the teacher’s motivation for implementing SAEs (Jenkins & Kitchel, 2009; Retallick, 2010; Robinson & Haynes, 2011; Wilson & Moore, 2007). Limited research exists to examine motivational approaches used in SAE programs and subsequent behaviors of students resulting from those motivational approaches. The continued decrease in SAE participation constitutes a problem that may be alleviated by examining how agriculture students have been effectively or ineffectively motivated to begin and continue participation in SAEs.

Purpose of the Study

We conducted a review of historical SAE literature to better understand how student motivation to initiate and participate in SAEs evolved during the first 60 years of vocational agriculture. The purpose of this study was to examine student motivation for SAEs through the lens of the Self-Determination Theory (Deci & Ryan, 1985a). Specifically, SAEs were analyzed according to the two central concepts of Self-Determination Theory: (a) regulatory styles and (b) perceived locus of causality (Ryan & Deci, 2000). This study aligns to Priority 5 of the National Research Agenda to develop highly effective agricultural education programs (Doerfert, 2011).

Theoretical Framework

Motivation is the “means to be moved to do something” (Ryan & Deci, 2000, p. 54). According to Self-Determination Theory, human behaviors are a result of motivating forces that fluctuate on a continuum. On one end of the continuum is intrinsic motivation, or being motivated by internal forces, and on the other end is extrinsic motivation, or being motivated by external forces (Schunk, Pintrich, & Meece, 2008). Self-Determination Theory proposes that human behavior is contingent on the level of choice an individual has before and during an activity. An individual will have a higher level of motivation for an activity if they believe the activity is self-directed (Deci & Ryan, 1985a). The motivating forces continuum can be further differentiated by two categories of when motivating forces can fluctuate: (a) regulatory styles and (b) perceived locus of causality (Ryan & Deci, 2000).

Regulatory Motivating Styles

Regulatory styles are the reasons or choices for beginning an action. Regulatory styles can fluctuate between highly controlled by the individual to highly uncontrolled by the individual. Regulatory styles are classified as being amotivational, extrinsic, or intrinsic to the individual (Ryan & Deci, 2000).
Amotivational regulatory styles

The antithesis of being motivated is amotivation. An individual may become amotivated when forced to participate in an activity rather than having a choice to participate in the activity. An individuals may be provided with little if any decision making opportunities throughout the activity and will often maintain a low value for the activity (Schunk, Pintrich, & Meece, 2008). Amotivation regulation styles can be harmful to an individual’s emotions related to the activity at hand (Abramson, Seligman, & Teasdale, 1978; Deci & Ryan, 1985a; Ryan, 1995). An individual who experiences an amotivational regulatory style is likely to develop negative feelings towards the activity as well as other persons or institutions associated with the activity (Ryan & Deci, 2000).

Extrinsic regulatory styles

An individual is classified as being externally motivated when they are persuaded, coerced, or enticed to choose participation in an activity (Vallerand & Bissonnette, 1992). This could include an individual participating in an activity primarily to receive extrinsic rewards or to avoid extrinsic punishments. Although the individual did in fact have a choice concerning participation, the individual was externally pressured enough to lose the feeling of self-directedness (Schunk, Pintrich, & Meece, 2008). The individual may not necessarily desire to participate but is ultimately persuaded to participate based upon external consequences (Ryan & Deci, 2000). An individual will be compliant simply to receive the reward or avoid the punishment; thus, the individual’s internal value for the activity may be diminished (Schunk, Pintrich, & Meece, 2008).

Intrinsic regulatory styles

An individual is intrinsically motivated when their actions are chosen based upon their internal aspirations (Deci, 1971) that have little or no external reward or consequence (Deci & Ryan, 1987; White, 1959). Actions driven by intrinsic regulations are often used to satisfy one or more of three needs influencing human behaviors: competence, a person’s need to feel a level of confidence in themselves and their abilities; relatedness, the feeling that one belongs to a group or community; and autonomy, one’s ability to feel control, choice, or direction (Deci & Ryan, 1985a; Ryan & Deci, 2002). Intrinsic motivation is looked upon as the most powerful and fulfilling regulatory style. The individual’s decision and/or consequences of participation are based solely on that individual; the internal meaningfulness before, during, and after the activity is what causes an individual to participate (Schunk, 2009).

Perceived Locus of Causality

The second category of fluctuating motivational factors is the perceived locus of causality (Ryan & Deci, 2000). Locus of causality describes how an individual chose to continue participating in an activity independent of the initial regulatory style. Locus of causality is classified as impersonal, external, or internal according to Self-Determination Theory (Ryan & Deci, 2000).

Impersonal causality

Impersonal locus of causality represents the least self-directed and least motivated level of causation for continuance of an activity. An individual will view the activity as being beyond their ability to control decisions and/or outcomes. An individual who experiences an impersonal locus of causality is likely to react to an activity in a submissive or passive manner (Schunk, Pintrich, & Meece, 2008). The result is an individual reluctant to continue the activity and will often become disengaged from that activity (Deci & Ryan, 1985b).

External causality

An individual can experience external causality if some level of self-directedness occurs during the activity. However, a distinctive difference is the individual feels compelled by an external force to continue participation in the activity. An individual may choose to continue to participate in an activity to gain an external reward, avoid some type of loss, or avoid a pun-
ishment (Schunk, Pintrich, & Meece, 2008). Although the individual has chosen to participate, the individual is less likely to continue the activity in the future because the choice to continue participation was derived from an external pressure (Ryan & Connell, 1989).

**Internal causality**

An individual may choose to continue a task if the task is inherently valuable (Vallerand & Bissonnette, 1992). In other words, the individual’s locus of causality is derived mostly from the interest held for the activity (Ryan & Connell, 1989). Although internal drive is ideal, an individual may not fully realize the internal meaningfulness of an event or activity unless they were first drawn to it through external means. An example would be someone who began an activity for only financial gain, but later found a high level of internal satisfaction from the experience. The individual may continue participation in similar future activities because of high internal meaningfulness and not for financial gain (Schunk, Pintrich, & Meece, 2008).

Self-Determination Theory proposes that human beings are more effectively motivated when allowed to be self-directed as opposed to being externally-directed during a given activity (Deci & Ryan, 1985a). In other words, human behaviors are more effectively initiated and sustained when an individual has an element of decision-making before and during an event or activity. An individual’s behaviors can be motivated by a variety of regulatory styles and perceived locus of causality combinations (Deci & Ryan, 2000). For instance, an individual can potentially begin an activity with an internal directedness, but later develop a more external or impersonal locus of causality towards the activity due to high levels of external directedness. Similarly, an individual could potentially be forced to begin an activity but later develop internal meaningfulness from a level of self-directedness. Figure 1 provides an overview of the taxonomy of human motivation proposed by Self-Determination Theory (Ryan & Deci, 2000).

![Figure 1. Taxonomy of human motivation in self-determination theory. Adapted and reprinted with permission from Ryan and Deci (2000), Academic Press.](image-url)
Methods

We used historical and qualitative interpretative research methods to develop an interpretation of student motivation for SAEs. We were interested in understanding the context and the evolution of SAE motivation through time. The variation of cases and time frames ensured a more detailed depiction of the historical development of SAEs (Rampolla, 2007; Spalding & Parker, 2007). We understood the contextual changes that occurred in agriculture, which affected school-based agricultural education and SAEs: including the changing nature of production agriculture, communities where agricultural education occurred, and the development of the SAE awards system (Boone, Doerfert, & Elliot, 1987; Moore & Borne, 1986; Retallick, 2010; Wilson & Moore, 2007). Thus, We identified primary and secondary sources covering a range of SAE practices and eras in agricultural education. Primary sources included interviews with former agriculture students (Gall, Gall, & Borg, 2007). The interviews were either found in the literature or conducted by us. There were two types of secondary sources utilized in this study.

One type of secondary source was written by agriculture teachers about their students’ SAEs. The student’s motivations were interpreted from how the teacher described the formation and continuance of student’s SAEs; the teachers were assumed to provide credible and accurate depictions of how students became involved and continued their SAE projects. The biases of the teachers were reduced by interpreting the requirements that the teachers set for students while they engaged in SAEs and the student responses that the teacher witnessed. The teacher’s personal opinions were not interpreted.

The second type of secondary sources was written by agricultural education professionals about the SAE practices of agriculture teachers and students. The student’s motivations were interpreted from how the agricultural education professionals described the formation and continuance of student’s SAEs; the agricultural education professionals were assumed to provide credible and accurate depictions of how students became involved and continued their SAE projects.

We examined historical magazines, documents, and books covering school-based agriculture for detailed cases of SAE participation. Three time periods were chosen based on the number of available sources of SAEs information and manuscript space restrictions. Examining cases from three different time periods allowed for historical trends to emerge. We did not interview current students because a contemporary time period analysis would have shifted the focus away from historical methods. We analyzed *The Agricultural Education Magazine* and 12 texts from 1928-1934; the time frame of 1947-1953 included the *The Agricultural Education Magazine*, *Better Farming Magazine*, and 21 texts; and We analyzed the *The Agricultural Education Magazine* and 9 texts from 1966-1973. While numerous cases emerged from the different time periods, especially during the time periods of 1928-1934 and 1947-1953, the page limitations of this manuscript limited the number of cases that could be described from each time period. Cases were chosen to highlight the variety of different types of SAEs within each time period. We also interviewed former FFA members that had in SAEs during the time frame of 1966-1973. The decision to include interviews was based on the number of cases that emerged from the literature during the time frame of 1966-1973. The third time period had fewer detailed cases of SAEs to analyze compared to the other two time periods. The pool of possible interviewees was collected from a list of six people generated by a state department of education staff. The interviewees were selected based on their level of engagement in FFA and their SAE. We utilized two of the three interviews conducted based on the limited space of the manuscript. First, a female was chosen to represent the unique, but growing population of agriculture students during the early 1970s. Second, a male was chosen who lived on a family farm, worked on the farm for his SAE, but then left the farm after graduating high school. We felt that these students were not recognized in the sources and were part of a growing number of agriculture students during the 1970s.

The data analysis occurred in a collaborative setting and the cases were analyzed for their defining characteristic, regulatory style, and locus.
of control. We categorized the cases by a defining characteristic that best represented the student’s motivation for conducting the SAE. We identified the characteristics to ensure a variety of cases were represented. The defining characteristics were not grounded in agricultural education literature. The characteristics were subjectively chosen by us and peer-reviewed with other agricultural education faculty for accuracy. The characteristics included (class) mandate, student interest/owned, collaboration, experiential learning opportunity, and awards. We then analyzed the cases for their regulatory style and locus of control. The interpretations were grounded in peer-reviewed researched definitions (Ryan & Deci, 2000) and examples provided by a campus professor with expertise in student motivation. Each case was analyzed and compared to the established definitions of regulatory style and locus of causality; cases were labeled with the regulatory style and locus of causality that most accurately represented the characteristics provided in the case. Although the available cases may have had missing information related to the regulatory style and locus of causality, we assumed the available case information to be holistically supportive of making regulatory style and locus of causality characterization interpretation. Each time period had a synopsis of the analysis of cases from that time period.

Trustworthiness and rigor of the research was maintained through research techniques that emphasized credibility, confirmability, and dependability. First, credibility was developed by utilizing consensus and peer-review techniques during the data analysis. An expert in motivational theory was consulted during the consensus process. Primary and secondary historical sources were exposed to external criticism to ensure credibility of the research. Bias was controlled by framing the interpretations in the cases to the case itself and through collaborative debriefing to ensure confirmability. Dependability was built through the inclusion of varying SAE examples and keeping an audit trail. Finally, we developed creditability by finding a variety of SAE cases to ensure a multitude of interpretations (Ary, Jacobs, Razavieh, & Sorensen, 2006; Gall, Gall, & Borg, 2007).

Findings

The findings were divided into three different subsections representing the three time periods included in the analysis. SAE projects were first individually described with a synopsis. Next, each time period case analysis was put into a table format to organize the findings. Then, we developed a description of each individual case.

SAEs from 1928 to 1934

We examined four SAE cases representing the time period from 1928 to 1934. The four defining characteristics of the SAE projects were found to be mandated production project, student interest/student owned project, collaborative project, and awards driven project. Two projects were found to have extrinsic regulatory styles; one project had an amotivational regulatory style, and one project had an intrinsic regulatory style. Three projects were found to have an internal locus of causality while one project had an impersonal locus of causality. The internal locus of causality to continue participation developed through either student-to-student competition or the desire to achieve high levels of accomplishment via FFA awards. The mandated SAE projects were interpreted to have an impersonal effect of student’s locus of causality because students viewed them as a negative component of vocational agriculture. The case descriptions for the time period of 1928-1934 are displayed in Table 1.
Table 1
Interpretive Analysis of SAE Motivators from 1928 to 1934

<table>
<thead>
<tr>
<th>SAE Data and Cases</th>
<th>Defining Characteristic</th>
<th>Categories of Motivation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mandated SAEs</td>
<td>Mandated</td>
<td>Regulatory Style</td>
</tr>
<tr>
<td>Martin’s poultry SAE</td>
<td>Production Project</td>
<td>Amotivational</td>
</tr>
<tr>
<td>Lebanon’s class SAE</td>
<td>Collaborative Projects</td>
<td>Intrinsic</td>
</tr>
<tr>
<td>SAE Awards</td>
<td>Award Driven Project</td>
<td>Extrinsic</td>
</tr>
</tbody>
</table>

The SAE mandate. The requirement of the Smith-Hughes Act of 1917 for all students to have a SAE was quickly adopted. In 1921-22, 79% of all agriculture students across the nation had a SAE (True, 1929) and this rose to about 90% by 1930 (Maltby, 1931). But, just because most students had a SAE did not mean that all students valued their SAE. Schmidt (1928) illustrated this situation quite well:

In too many instances the project has been regarded as something that must be done because it has been made a requirement. In a school where such an attitude prevails, many of the boys who are studying vocational agriculture regard the projects as a six-month sentence at hard work to be served as a result of selecting the training course in vocational agriculture (p. 260).

Martin’s poultry SAE. As the special editor of the supervised practice section of The Agricultural Education Magazine, G. A. Schmidt reported about SAEs. One such report was a short article about the poultry flock of Martin Rand (1930). As a sophomore Martin wanted to raise a poultry flock of 500 hens on his farm, despite his father’s reluctance. His father initially suggested 50-100 hens, but Martin persisted and eventually his father gave in. Martin built the brooder houses, started a flock, and by the first year made almost $1,000. Martin’s father was so impressed that he encouraged his son to increase the poultry business, invited his other son into a family partnership, and together raised 2,400 baby chicks by year three (Schmidt, 1930).

Lebanon’s class SAE. F. A. Blauer (1930), agriculture teacher of Lebanon, Kansas, conducted a class poultry operation for seventeen students who did not live on a farm. He shared the results of this class SAE in an Agricultural Education Magazine article. The students built the poultry house, cared for the laying hens, and conducted experiments. The results of the production experiments were shared with the community, as well as the products the students produced. Blauer reported that students were highly interested in the collaborative project. “A contest spirit prevails among the boys. Such questions as ‘Whose pullets laid the most eggs this week?’, ‘How many eggs today?’, and ‘How are the birds doing?’ are often heard” (p. 54).

SAE awards. The first student awards established for the National Organization FFA were the FFA degrees. The varying levels of degrees were awarded partially based on the students’ SAE. The degree system was designed to recognize students at the local chapter, state association, and national organization level. Nominations for an American farmer degree were privileges that went to the top students in each state (Groseclose, 1929). For instance, James Neal was nominated for the America farmer degree from Oregon in 1931. His biography included:

Neal has been actively identified with the Oregon association and served the organization as its first president. He is a leading character in the Oregon Future Farmer motion picture film made by Southern Pacific Railway during the annual Smith-Hughes Week-end at Oregon Agricultural College, to explain the work of vocational agriculture as carried on in Oregon. James was also the president of his local chapter (Crabtree, 1931, p. 192).
Soon after the establishment of the FFA degree award system, practitioners realized the power of SAE awards to motivate students (Bible, 1941).

**SAEs from 1947 to 1953**

We examined four SAE cases representing the time period from 1947 to 1953. The four defining characteristics of the SAE projects were found to be two required collaborative projects, one mandated placement project, and one student interest/student owned project. The required collaborative projects and mandated placement project were found to have extrinsic regulatory styles while the student interest/student owned project had an intrinsic regulatory style. The two required collaborative projects both had an external locus of causality, but for different reasons; one external locus of causality was derived from money while the other was viewed as a “burden” that must be continued due to its requirement. However, the mandated placement project had an internal locus of causality due to stimulation of the student’s interest. The student interest/student owned case was initially started based on the student’s intrinsic motivation and continued to be derived from an internal locus of causality. The data and case descriptions from 1947-1953 are displayed in Table 2.

<table>
<thead>
<tr>
<th>SAE Data and Cases</th>
<th>Defining Characteristic</th>
<th>Regulatory Style</th>
<th>Locus of Causality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kalispell FFA Chapter’s</td>
<td>Collaborative Projects</td>
<td>Extrinsic</td>
<td>External</td>
</tr>
<tr>
<td>SAEs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Joe Harris’s Family Ranch</td>
<td>Student Interest/Student Owned</td>
<td>Intrinsic</td>
<td>Internal</td>
</tr>
<tr>
<td>Battle Ground School Farm</td>
<td>Collaborative Projects</td>
<td>Extrinsic</td>
<td>External</td>
</tr>
<tr>
<td>Urban Placement SAEs</td>
<td>Mandated Placement Project</td>
<td>Extrinsic</td>
<td>Internal</td>
</tr>
</tbody>
</table>

**Kalispell FFA chapter’s SAEs.** The following excerpt comes from G. P. Deyoe’s book, *Farming Programs in Vocational Agriculture* (1953). Deyoe’s research and writings on SAEs were the most extensive in the history of agricultural education. Deyoe included the Kalispell FFA chapter in his section about chapter-wide SAEs:

The supervised farming programs of 112 individual boys in a recent year included an average of three improvement projects as well as the ownership projects. The chapter operates a farm of 100 acres on which is demonstrated the restoration of fertility, the reduction of alkalinity, and the control of weeds…. The members are paid dividends on shares which they own in the chapter farm (Deyoe, 1953, p. 218).

**Joe Harris’s family ranch.** The following excerpt also comes from Deyoe’s *Farming Programs in Vocational Agriculture* (1953) text. This text, along with the early edition of the same text (Deyoe, 1947), contained a multitude of detailed examples of SAEs. Deyoe’s presented this example within his section entitled accomplishments of individuals in their farming programs:

When Joe [Harris] was in the fourth grade, his father died. Joe, and older brother Sam, and his mother agreed to...
keep the 3,800 acre ranch going, and each brother was promised a one-third partnership upon graduation from high school. They developed an extensive cattle enterprise. To aid in hay-making on a large scale, they constructed buck rakes and hay stackers. When Sam was called into the armed forces, Joe became manager of the ranch and the herd of 700 cattle. A major development was the construction of a reservoir for impounding water from a spring; this increased the irrigation potential from 20 acres to 300 acres (Deyoe, 1953, p. 221).

Battle Ground’s school farm. B. Brown (1949), the agricultural supervisor from Olympia, Washington, reported on his program’s school farm in *The Agricultural Education Magazine*. Brown described how he managed labor and instruction of the 51 acre school farm: The class program is kept flexible so that, if weather permits, a class can go to the farm on short notice. Lockers are provided in which each boy keeps farm work clothes and shoes. Acreage of each crop is rather small so that the labor does not become monotonous. A boy learns to prune raspberries in one or two hours. A week of it would have little or no educational value. Experience driving tractors, plowing, and disk ing, is possible for all boys in the department (p. 62). The profits were used to finance the program and students were paid a wage for their work.

Urban placement SAEs. Jamaica Plains and East Weymouth High Schools of Massachusetts, both near Boston, had to adapt to the SAE requirements to fit the placement experiences available to their students. Most of the students did not live on farms (Deyoe, 1947; Nelson, 1950). Over a four year program, students of Jamaica Plains and East Weymouth agricultural programs were expected to spend their summers working with a variety of different local agricultural businesses. Students gained experience in the fields of marketing garden produce, poultry farming, dairy production, and greenhouse operations. This variety of experiences would be hard to duplicate in an individual student’s entrepreneurial production experience, especially in an area near Boston. These types of placement experience arrangements were popular in ever increasingly metropolitan states, such as Massachusetts, because up to 90% of the students did not have the home facilities for an individual production or non-production agricultural experience (Taft, 1960).

SAEs from 1966 to 1973

We examined five SAE cases representing the time period from 1966 to 1973. The five defining characteristics of the SAE projects were found to be two mandated projects, one award driven project, one student interest/awards project, and one student interest project. All five projects were found to have extrinsic regulatory styles. Two of the five cases were interpreted to have developed an internal locus of causality originating from personal preference of the project. Three of the five cases were interpreted to have an external locus of causality derived from money, power, requirements, or seeking approval from others. The data and case descriptions from 1966-1973 are displayed in Table 3.
Table 3
Interpretive Analysis of SAE Motivators from 1966 to 1973

<table>
<thead>
<tr>
<th>SAE Data and Cases</th>
<th>Defining Characteristic</th>
<th>Categories of Motivation</th>
<th>Regulatory Style</th>
<th>Locus of Causality</th>
</tr>
</thead>
<tbody>
<tr>
<td>New SAE Awards</td>
<td>Award Driven Projects</td>
<td>Extrinsic</td>
<td>Internal</td>
<td></td>
</tr>
<tr>
<td>Outdoor Recreation SAE</td>
<td>Student Interest &amp; Award Driven Project</td>
<td>Extrinsic</td>
<td>Internal</td>
<td></td>
</tr>
<tr>
<td>South Rowan High School’s Placement SAEs</td>
<td>Mandated Placement Project</td>
<td>Extrinsic</td>
<td>External</td>
<td></td>
</tr>
<tr>
<td>Loudonville’s Production SAEs</td>
<td>Mandated Production Project</td>
<td>Extrinsic</td>
<td>External</td>
<td></td>
</tr>
<tr>
<td>A Dairy Operation</td>
<td>Student Owned Project</td>
<td>Extrinsic</td>
<td>External</td>
<td></td>
</tr>
</tbody>
</table>

**New SAE awards.** School-based agricultural education, especially SAEs, changed after the passage of the Vocational Education Act of 1963. Agriculture curriculum had a broader perception of agricultural careers. Students began to have SAEs in broader agricultural careers as well. SAEs were no longer mandated for each student, though individual agriculture programs could still require students to have SAEs. Professionals argued for an update to the SAE award system of the FFA, including proficiency awards, to include more off-farm activities (Kantner & Bender, 1967; Selland & Vog, 1969; Sheppard, 1968). In response to the external pressures the National FFA Organization began to adapt proficiency awards starting in 1970. The changes included the addition of proficiency awards, such as outdoor recreation and forest management, and the inclusion of a placement category to many of the pre-existing proficiency areas (Seefeldt, 1970). These awards would motivate those students in these newer areas by providing them the same level of recognition as students with traditional projects.

**Outdoor recreation SAE.** The following excerpt was from an interview with a former female FFA member. She was part of a growing minority in agricultural education during that time period. The decision to start the SAE was partially grounded in the likelihood that she could win a proficiency award:

He [the FFA advisor] would do home visits to each student home and interview the family and student to determine the student interest and capability to complete the SAE. We were raising beef cattle and raised tobacco and tomatoes, yet my Advisor knew that I would not be competitive in those areas so we went with the area I was the strongest. My family had sold the dairy farm when I entered high school and bought 70 acres on which we developed a campground. I was able to compete in the outdoor recreation proficiency and won the Southern Region (personal communication, April 11, 2011).

**South Rowan High School’s placement SAEs.** John W. Allison (1966) was an agriculture teacher that believed in the value of every student having a SAE. He was the agriculture teacher from South Rowan High School in China Grove, NC. The excerpt from The Agricultural Education Magazine was brief, but Allison provided many details about how he managed his students’ SAEs, including facilitating students’ placement experiences:

Out of 113 students enrolled in vo-ag we have 55 engaged in work experiences away from their homes. These work experiences include work on highly spe-
cialized horticulture farms, dairy farms, general farms and produce farms. Our boys realize they are being graded by the farm manager as well as the teacher of agriculture. Systematic raises in pay when earned get a good effort from all students. As students get more experience and exhibit leadership, they are used as field supervisors to direct fellow workers (Allison, 1966, p. 53).

**Loudonville’s production SAEs.** J. Nowels, of Loudonville, Ohio, was another agriculture teacher that required students to have a SAE, but in this case students had to have entrepreneurial, production projects. Nowels’ (1973) *Agricultural Education Magazine* article also included his philosophy of a complete program of school-based agriculture:

Students in our vocational agriculture department must carry a minimum of two production projects and three improvement projects per student…. In my 25 years of teaching vocational agriculture (21 years here at Loudonville) their requirement has always been met readily by interested students regardless of whether they live on a farm or in town. One hundred per cent of our membership has always exhibited projects at our Ashland County Fair and our local Loudonville Fair…. Nearly all of our students have 100 per cent ownership of their production projects (Nowels, 1973, p. 248).

**A dairy operation SAE.** The following quote is from a former FFA member in the later 1960s. His father was his FFA advisor and he eventually became an agriculture teacher himself. Interestingly, the man talked about his past experience in both the awards he won and life lessons he learned:

I was born into a dairy operation and that was the basis for my SAE. Dad gave me ownership in 2 cows as a freshman in return for milking every morning and afternoons when school or sport activities didn’t interfere. I was also responsible for working the fields raising corn and hay for feed…. My dairy operation expanded to 20 cows and replacement heifers through high school and first year of college. I placed 1st in dairy proficiency at the Middle TN regional level. I learned a lot of valuable skills related directly to dairy and crop production. Most importantly, I learned self-discipline and the importance of hard work which helped me get through college and eventually a successful teaching career (personal communication, April 11, 2011).

**Conclusions, Implications, and Recommendations**

The purpose of this study was to examine student motivation for supervised agricultural experiences (SAEs) through the lens of Self-Determination Theory. From the cases occurring during the 1928-34 era, three of the four cases initiated participation in SAEs by means of externally motivating factors. Three of the four cases in this time period were also sustained by an internal locus of causality. Three of the four cases from 1947-1953 began based on extrinsic motivation of the student. Two of the cases had an external locus of causality while two had an internal locus of causality. All five from 1966-73 began with extrinsic motivation and three of the five cases in this time period being sustained by an external locus of causality.

A conclusion from these findings was that initiating student participation in SAE projects during the selected time periods has been driven by external motivating factors more than internal motivating factors. External motivators appeared in the form of mandating SAE participation, awards, or collaborative SAEs required at school. Internal motivators appeared in the form of student interests and/or student owned projects. These conclusions support the findings of contemporary research on teachers’ facilitation of SAEs. Specifically, Wilson and Moore (2007) found that student participation in SAEs was driven by the teachers’ desire for FFA awards. The FFA award system was also listed as a motivator to implement SAEs by the teachers interviewed in Retallick’s (2010) study. These three conclusions are supported by exist-
ing literature stating external motivators are sometimes necessary to begin an action (Deci, Eghart, Patrick, Leone, 1994; Deci & Ryan, 1985a). Four cases in this study demonstrated SAEs could be started using external motivational strategies, but this motivation can be transitioned into students having an internal drive to continue their SAE. The findings from this study imply that the use of external motivators, though not ideal according to motivational theories, can be a means to initiate student SAE participation (Ryan & Deci, 2000).

We recommend agricultural education practitioners continue to utilize external motivators with caution to introduce students to SAEs. Practitioners should strive to find ways to internally motivate students to participate in SAEs. Reeve (2009) proposed a list of strategies teachers can utilize to enhance students’ intrinsic motivation in learning environments. Educators could better initiate students’ intrinsic motivation for SAEs by applying strategies such as focusing on students’ personal interests related to SAE areas, designing SAEs that would be personally meaningful to the student, or providing rationale to students as to how and why SAEs are important to their educational and/or personal development.

Another conclusion was five SAE cases were started with external motivational approaches and the locus of causality remained external. An internal locus of causality was not evident when SAEs were deemed as only a requirement for the course or continued for money. According to motivational research (Deci & Ryan, 1985a; Ryan & Deci, 2000), the use of external motivating approaches can lead to a lowered chance of gaining an internal locus of causality for the SAE project. Reaching a point of internal locus of causality is ideal according to Self-Determination Theory. The implication from this finding is that externally rewarding students’ continued participation in SAEs, either through program requirements, money, or awards, can condition students for the award more so than the experience. This could subsequently diminish the students’ internal drive for the experience.

It is recommended that agricultural education practitioners use caution when assigning external rewards for student’s participation in learning activities such as SAEs. Overuse of external rewards such as money, trophies, or recognition can potentially reduce a student’s acquisition of the “true” SAE values of enhanced learning and career exploration. Practitioners should strive to help students realize the value of SAEs as a means to learning knowledge and career skills within an agriculture context that can be later transferred to contexts beyond agriculture. Simply put, educators should help students find value in SAEs beyond a plaque and a paycheck.

We acknowledge the limitations of transferability of the findings. The cases included in this study were only interpreted based on what information was provided by the sources. Historical researchers need to continue identifying detailed historical SAE sources to better understand the evolution of SAEs. Future historical research should investigate the motivation of students through historical narrative methods. Historical narrative methods would focus on a couple of students and develop a more detailed historical description of SAEs. This historical analysis found that motivating students to participate in SAEs has been a concern since the 1930s, which echoes the findings of present day SAE research. Navigating the boundaries between using extrinsic rewards and developing an intrinsic drive has been a continual challenge. Considering the decreasing number of agriculture students with a SAE, further research and subsequent instructional approaches are needed to strike a balance between intrinsic and extrinsic motivating strategies to improve the implementation and continuation of valuable SAEs.
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WILLIAM A. BIRD is an Assistant Professor in the Department of Agricultural Leadership, Education and Communication at the University of Nebraska-Lincoln, 303A Ag Hall, Lincoln, NE 68583, wbird2@unl.edu.

MICHAEL J. MARTIN is a Graduate Student in the Department of Agricultural Education at the University of Missouri, 125 Gentry Hall, Columbia, MO 65211, mjmgg7@mail.missouri.edu.

JON C. SIMONSEN is an Assistant Professor in the Department of Agricultural Education at the University of Missouri, 121 Gentry Hall, Columbia, MO 65211, simonsenj@missouri.edu.
The Influence of Collaborative Reflection and Think-Aloud Protocols on Pre-Service Teachers’ Reflection: A Mixed Methods Approach

Cory M. Epler
Nebraska Department of Education
Tiffany A. Drape
Thomas W. Broyles
Rick D. Rudd
Virginia Tech

The purpose of this mixed methods study was to determine if there are differences in pre-service teachers’ depth of reflection when using a written self-reflection form, a written self-reflection form and a think-aloud protocol, and collaborative reflection. Twenty-six pre-service teachers were randomly assigned to fourteen teaching teams. The teams taught a lesson that was videotaped and completed a written self-reflection form while viewing their lesson. The participants were randomly assigned to a control group or experimental group. The control group reflected individually using a written self-reflection form. Experimental Group #1 reflected collaboratively using a written self-reflection form, and Experimental Group #2 reflected individually using a think-aloud process while completing the written self-reflection form. The reflection forms were analyzed for depth of reflection, and a one-way ANOVA revealed significant differences in depth of reflection between the three groups. Participants also engaged in focus group interviews to describe their experiences. Two significant themes emerged: reflection on the teaching experience and reflection on the process used. We recommend that reflection should be used to help pre-service teachers learn from experience. In addition, the use of collaborative reflection and reflection using think-aloud protocols should be considered to promote deeper reflection and understanding.

Keywords: reflection; pre-service teacher reflection; collaborative reflection; think-aloud protocol

Introduction/Conceptual Framework

The challenges associated with preparing teachers for the 21st century are great. In fact, the National Council for Accreditation of Teacher Education (NCATE) recently reported that teacher education programs should be overhauled from subject-matter, theory-laden programs to programs rooted in experience and clinical practice (National Council for Accreditation of Teacher Education, 2010). The council reported that more emphasis should be placed on “giving teacher candidates their sea legs by helping them develop and study their practice,” (NCATE, 2010, p. 3). Furthermore, in the National Research Agenda for the American Association for Agricultural Education, Doerfert (2011) pointed out there is a disconnect between the science of learning and the practice of teaching. He explained that despite the solid research base associated with learning, “a gap exists between the science of meaningful learning and the practice of teaching for meaningful learning” (Doerfert, 2011, p. 22). With this in mind, it is necessary for teacher preparation programs to provide pre-service teachers with meaningful learning opportunities rooted in experience.

One method teacher preparation programs can utilize to help pre-service teachers examine their teaching practices is reflection. Reflection plays a central role in most teacher preparation programs and is a valuable component of professional development (The Association of...
Reflection is identified as a method that helps practitioners better understand what they know and do through a consideration of what they learn in practice, and the process places an emphasis on learning from doing (Loughran, 2002). It is widely acknowledged that reflection is prerequisite for in-depth understanding and for furthering professional development (Tigelaar, Dolmans, Meijer, De Grave & Van Der Vleuten, 2008).

John Dewey, a key originator of the concept of reflection, described reflection as a problem solving process. The reflective process begins when a person encounters an experience that involves “(1) a state of doubt, hesitation, perplexity, mental difficulty, in which thinking originates, and (2) an act of searching, hunting, inquiring to find material that will resolve the doubt, settle and dispose of the perplexity,” (Dewey, 1933, p. 12). Dewey’s work supported the notion that reflection is a cognitive process and a special form of problem solving. This process resolves an issue through active chaining, careful ordering, and linking multiple ideas together (Hatton & Smith, 1995). Reflective thinking cannot be compared with simply “thinking things over,” (Rodgers, 2002). Reflective thinking is a rigorous and disciplined way of thinking nested in scientific inquiry and it requires attitudes that value the personal and intellectual growth of the learner through the process. A more contemporary examination of reflection utilizes Schön’s conceptualization that reflection is intimately bound with action (Schön, 1983). Schön emphasized that professionals should learn to frame the problems they are facing, test various hypotheses to solve the problem, and modify actions as a result (Hatton & Smith, 1995; Schön, 1983). Often described as “reflection-on-action,” this requires implementation of solutions that stem from reflecting after an action is completed (Schön, 1983; Yost, Sentner, & Forlenza-Bailey, 2000). The process requires that individuals examine performed tasks in order to review what happened, and it provides an opportunity to examine the relationship and connection of one experience to another (Kim & Lee, 2002; Rodgers, 2002).

Using Dewey and Schön’s notions of reflection as a guide, teacher educators continue to employ strategies that promote the reflection of pre-service teachers. Despite doing so, teacher preparation programs are often scrutinized for not adequately preparing future educators. The process of reflection, when integrated within teacher preparation programs, is a tool that will help prepare future teachers (Lee, 2005). The goal of reflection in teacher preparation is to develop a teachers’ reasoning about why they used a certain instructional strategy and how they can improve their teaching to have a positive effect on students (Lee, 2005). Many teacher education programs claim to be reflective in their practice, but Rodgers (2002) pointed out this is often missing in a thorough exploration of teacher preparation programs. The experiences within teacher preparation programs should broaden the field of experience and knowledge, yet experiences alone are not enough. The addition of reflection to pre-service teachers’ experience allows them to make meaning from experience. This enables pre-service teachers to make sense and draw conclusions from their experiences within a teacher preparation program. Reflection is necessary to help make meaning from experience (Rodgers, 2002). Even though the importance of reflection is documented, Greiman and Bedtkke (2008) reported in their study of 31 agricultural education teacher education departments, only one department utilized reflection as an instructional planning component.

Authors of teacher preparation literature described several strategies that help pre-service teachers become more reflective. Those strategies include journaling, peer teaching demonstrations, case studies, and action research projects (Hatton & Smith, 1995; Yost, Sentner, Forlenza-Bailey, 2000). A common strategy utilized in teacher preparation programs is reflective teaching. Reflective teaching promotes growth through analysis and self-directed evaluation (Calderhead, 1987). In many of these teaching experiences, teachers reflect individually using a written self-reflection form to capture their thoughts. In fact, most reflective experiences utilize individual or intrapersonal reflection (Kim & Lee, 2002). In
individual reflection, the learners deliberate and think to themselves about the experience.

While individual reflection is certainly meaningful, in some cases, collaborative reflection can promote deeper reflection. In collaborative reflection, individuals reflect through group discussion and discourse. The experience is not purely an individual process, but it is a process in which learners construct meaning in a situated context (Kim & Lee, 2002). Discussing and comparing experiences with others deepens the learning experience. Collaborative reflection helps teachers refine their teaching skills and approaches to teaching and provides a means for improvement (Martin & Double, 1998). Essentially, working with a partner allows a deeper level of analysis that might be impossible to obtain otherwise. Previous researchers revealed the positive benefits of collaborative reflection and have concluded that collaborative reflection facilitates higher-order thinking when compared to individual reflection (as cited in Kim & Lee, 2002). Hawkey (1995) reported that pre-service teachers expressed a desire to share experiences and knowledge with their peers. They benefitted from the skills and support of their peers. Raywind (1993) concluded that collaborative reflection helps facilitate professional growth and development. By reflecting together, teachers can take their knowledge to the next level through deeper analysis, application, and evaluation (Nicholson & Bond, 2003).

Finally, a think-aloud protocol is a widely used technique that provides information about individuals’ cognitive processes (Sasaki, 2008). In an attempt to better understand how professionals use knowledge to make decisions, researchers commonly used think-aloud protocols (Corcoran, Narayan, & Moreland, 1988). Think-aloud protocols are “retrospective reports,” wherein an individual reports his or her thoughts about a task after it has been completed (Sasaki, 2008, p. 350). When thinking aloud, individuals must maintain focus on the completion of the task and merely verbalize their thoughts (Ericsson & Simon, 1998). This can be challenging because many specific tasks are often automatic (Corcoran, Narayan, & Moreland, 1988). A think-aloud report represents the information held in short-term memory and is considered a direct representation of an individual’s cognitive processes (Corcoran, Narayan, & Moreland, 1988; Sasaki, 2008). These reports allow an individual to search for meaning, theorize, or interpret his or her own behavior and actions. The process promotes deeper reflection as individuals use previously acquired mental representations to plan, evaluate, and reason between alternative solutions (Ericsson & Simon, 1998).

Finally, think-aloud protocols promote the strategic processing of information; therefore the process may lead to a deeper understanding of the cognitive and metacognitive processes one uses. Because learning to teach involves complex interactions between cognitive and metacognitive processes, the think-aloud process facilitates reflection as a valuable learning experience for teachers (Calderhead, 1987). Even so, there remains a lack of research to examine think-aloud protocols and their influence on teacher reflection. For example, the majority of research associated with think-aloud protocols is used to gain insight into individuals’ reading processes in an attempt to help identify the differences between less able and more able readers (Berne, 2004). With this in mind, incorporating think-aloud protocols in reflective experiences should create a deeper and more meaningful learning experience.

**Purpose and Objectives**

Because reflection creates meaningful learning experiences within teacher preparation programs, the reflective experiences of pre-service teachers should be examined. Furthermore, teacher educators should create reflective experiences that maximize learning through reflection. Drawing upon Dewey’s conceptualization of reflection and Schön’s notion of reflection-on-action, several questions emerge related to the reflective experience of pre-service teachers. How can teacher educators create meaningful reflective experiences for pre-service teachers? Are the reflective experiences of pre-service teachers designed to maximize depth of thinking and promote advanced critical thinking skills? As collaboration and the use of think-aloud protocols promote greater cognitive
and metacognitive processing, will reflective experiences utilizing collaboration and think-aloud protocols lead to deeper reflection? The specific research questions that guided this study include:

1. What are the differences in depth of reflection for pre-service teachers when using individual reflection, individual reflection using a think-aloud protocol, and collaborative reflection?
2. How do pre-service teachers describe their experience when reflecting individually, collaboratively, and using a think-aloud protocol?

**Methodology**

To address the above research questions, we selected a convergent parallel mixed methods research approach (Creswell & Plano-Clark, 2011). The purpose of a convergent parallel design is to “obtain different but complementary data on the same topic” (Creswell & Plano-Clark, 2011, p. 77). This particular design is useful when the researcher wants to triangulate the methods by comparing and contrasting quantitative statistical results and qualitative findings. In the convergent parallel design, quantitative and qualitative data are collected and analyzed separately. The merging of the two sets of data typically occurs as discussion or as part of the conclusions based on data analysis (Creswell & Plano-Clark, 2011). The method is also particularly useful when the data are transformed from one type into the other type of data (i.e. transforming qualitative themes into quantitative counts).

The convenience sample included pre-service teachers enrolled in the Career and Technical Education teacher preparation program at a large university in the mid-Atlantic region. This teacher preparation program meets the requirements set forth by the state department of education and upon completion of the program, participants will have earned a Master’s Degree in Career and Technical Education (CTE), with a specialization in Agricultural Education, Business and Information Technology, Marketing, or Family and Consumer Sciences. All participants hold a Bachelor’s degree within their discipline specific to their intended certificate. There were twenty-six participants. Twelve participants were pursuing Agricultural Education certification, ten were pursuing Business and Information Technology/Marketing Education, and four participants were completing a concentration in Family and Consumer Science Education. Seventy-three percent of the participants were female (19 participants).

Upon receiving university Institutional Review Board approval and obtaining written consent from the participants, teaching teams (two participants per group) were randomly assigned to teach the same pre-written lesson. The teaching teams taught their lessons to their peers in a teaching demonstration which was videotaped. Following the peer teaching demonstration, the participants participated in a reflective experience where they completed a written self-reflection form while viewing their videotaped lesson. The written self-reflection form asked participants to reflect on three domains using three reflection prompts. The reflection prompts included: (1) What were my particular strengths in this area?, (2) What would I change in regards to this particular area?, and (3) How could I go about making that change?

The first domain asked the participants to analyze their ability to communicate with students. This domain included three sub-domains: (1) directions and procedures, (2) explanation of content, and (3) expectations for learning (Danielson, 2007). The second domain focused on the discussion techniques the participants used while teaching. This domain had three sub-domains: (1) quality of questions, (2) discussion techniques, and (3) student participation (Danielson, 2007). The final domain included an analysis of the ability of the pre-service teachers to demonstrate flexibility during their lesson. This domain included three sub-domains: (1) lesson adjustment, (2) response to students, and (3) persistence (Danielson, 2007).

Six participants were randomly assigned to the control group. The remaining participants were randomly assigned to two experimental groups. Experimental Group #1 included 14 participants (seven teaching teams), and Experimental Group #2 included six parti-
Participants. Experimental Group #1 participated in a collaborative reflective experience in which a written self-reflection form was utilized. The seven teaching teams watched their videotaped lesson and completed their written self-reflection form as a pair, and they were encouraged to discuss the experience while completing the written self-reflection form. Experimental Group #2 completed an individual reflective experience using written self-reflection form and a think-aloud protocol. In this group, the six participants were asked to verbalize their thoughts before completing the written self-reflection form. The control group included six participants who completed an individual reflective experience using only the written reflection form. The control group completed their written self-reflection form as they watched their videotaped lesson. To ensure consistency of the reflective experience and minimize distractions, the experimental groups and the control group watched their videotaped lesson in an assigned classroom on campus.

After the experimental groups and the control group completed the reflective experience, we analyzed the reflection forms using a researcher-developed categorization scheme that was created from previous research that analyzed depth of reflection (Facione, 1990; Kember et al., 1999; Lee, 2005; Mezirow, 1990; Wong, Kember, Chung, & Yan, 1995; Yost, Sentner, & Forlenza-Bailey, 2000). Each sub-domain of the reflection forms were analyzed independently for the control group and experimental groups. Scores were assigned ranging from one to three and half scores were assigned if responses included characteristics of two levels. Each researcher categorized the self-reflection forms for all groups using a categorization scheme synthesized from the literature. The categorization scheme allowed us to classify the depth of reflection based upon three levels identified through previous research: (1) recall level: R1, (2) rationalization level: R2, and (3) reflectivity level: R3 (Lee, 2005). Data were recorded in the written form by each researcher and converted to an Excel file. The data were analyzed using JMP 8.0 for Windows™ statistical package. We established a priori a minimum significance level of 0.05. According to Coolidge (2006), this is the conventional minimum level of significance. The researcher developed categorization scheme and a description of each level follows.

**Recall Level (R1)**

This level describes the characteristics of “non-reflectors” who indicate a simple awareness of the experience (Lee, 2005; Mezirow, 1991; Wong et al., 1995). Participants identified as non-reflectors and categorized within this level described what happened during the teaching experience, rather than providing a rationale for why the happenings occurred. In addition, the participants classified as R1 described their attempts at modeling teaching methods they observed or were taught, yet they focus on only recalling the experience of using those methods. At this level, the participants referred to their thoughts and feelings, but did not describe how or why those feelings were developed (Kember et al., 1999).

**Rationalization Level (R2)**

This level describes characteristics of “reflectors” who possess the ability to critique perception, thinking, and judgment while extracting meaning from an experience (Facione, 1990; Lee, 2005; Mezirow, 1991; Wong et al., 1995). In this experience, participants identified as reflectors interpreted their teaching experience with a rationale for why happenings might have occurred. In addition, the participants examined the intended and actual relationships between pieces of their experiences and described their search for why happenings occurred. Reflectors were able to generalize their experiences and create guiding principles for future lessons. At this level, the participants referenced their thoughts and feelings, described how and why their feelings were developed, and assessed the logical strength of their feelings (Facione, 1990; Kember et al., 1999).

**Reflectivity Level (R3)**

Participants classified within the R3 level – “critical reflectors” – approached the experience with the intention of changing/improving their
teaching in the future (Lee, 2005; Mezirow, 1991; Wong et al., 1995). As a result of the reflective experience, the critical reflectors were able to form strong hypotheses based upon the evidence at hand (Facione, 1990). Additionally, the participants provided justification for multiple perspectives as they examined the issues they faced while teaching. Critical reflectors appear amendable to change, and they described how their teaching might influence their students’ behaviors and actions. Furthermore, critical reflectors framed their decisions within the broader ethical, moral, political, and historical decisions behind their actions (Yost, Sentner, Forlenza-Bailey, 2000).

Following the reflective experiences, focus groups were conducted. The focus groups allowed the participants to have time to reflect and recall experiences in a group setting where one response can trigger additional feedback from the rest of the group (Lofland, Snow, Anderson, & Lofland, 2006). We conducted three separate semi-structured focus group interviews, and each focus group interview had one facilitator. Homogeneous groups were selected by us to ensure participants within each focus group experienced either the control or treatment groups. The focus groups lasted 30 minutes. Data analysis for the focus group interviews began during the interviews with probing and follow-up questioning. All interviews were audio recorded and transcribed verbatim by us. Researchers employed the comparative analysis method to analyze the data (Corbin & Strauss, 2008). Investigator triangulation enhanced the reliability and trustworthiness of the data (Patton, 2002). Each researcher completed initial thematic analysis to increase the reliability of the analysis. Following the initial thematic analysis, We discussed the preliminary coding scheme in order to reach consensus regarding inconsistencies among the codes.

**Findings**

The reflection forms were analyzed using a researcher developed categorization scheme based upon previous researchers’ efforts to analyze depth of reflection. A one-way between subjects ANOVA compared the effect on type of reflective experience on the raters’ overall mean scores. There was a significant difference on the type of reflective experience according to the raters’ overall mean score at the p<.05 level for the three experiences [F(2, 16) = 6.81, p = 0.007]. Post-hoc comparisons using the Tukey-Kramer HSD test indicated that the raters’ overall mean score for the control group (written reflection only) (M = 1.65, SD = 0.31) was significantly different than Experimental Group #1 (collaborative reflection) (M = 1.22, SD = 0.16). An effect size of 1.73 indicates a non-overlap of 75.4% in the two distributions (Cohen, 1988). Experimental Group #2 (think aloud) (M = 1.47, SD = 0.10) did not significantly differ from the collaborative and individual reflection groups. Table 1 provides the total mean score for the control group and experimental groups.

<table>
<thead>
<tr>
<th>Table 1</th>
<th>Total Mean Scores of Control Group and Experimental Groups</th>
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<tbody>
<tr>
<td>n</td>
<td>M (SD)</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Control</td>
<td>6</td>
</tr>
<tr>
<td>Experimental Group #1</td>
<td>14</td>
</tr>
<tr>
<td>Experimental Group #2</td>
<td>6</td>
</tr>
</tbody>
</table>

*Note. Control group completed an individual reflective experience using only the written reflection form. Experimental Group #1 participated in a collaborative reflective experience in which a written self-reflection form was utilized. Experimental Group #2 completed an individual reflective experience using written self-reflection form and a think-aloud protocol. Possible score range is 1-3. *p < .05.
Table 2

Mean Scores of Constructs for Control Group and Experimental Groups

<table>
<thead>
<tr>
<th></th>
<th>Communicating With Students</th>
<th>Discussion Techniques</th>
<th>Flexibility During Teaching</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>M (SD)</td>
<td>d</td>
<td>M (SD)</td>
</tr>
<tr>
<td>Control (n = 6)</td>
<td>1.70* (.11)</td>
<td>5.04</td>
<td>1.72 (.13)</td>
</tr>
<tr>
<td>Experimental Group #1</td>
<td>1.17* (.10)</td>
<td></td>
<td>1.31 (.12)</td>
</tr>
<tr>
<td>(n = 14)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Experimental Group #2</td>
<td>1.47 (.11)</td>
<td></td>
<td>1.52 (.13)</td>
</tr>
<tr>
<td>(N = 6)</td>
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</table>

Note. Control group completed an individual reflective experience using only the written reflection form. Experimental Group #1 participated in a collaborative reflective experience in which a written self-reflection form was utilized. Experimental Group #2 completed an individual reflective experience using written self-reflection form and a think-aloud protocol. Possible score range is 1-3. *p < .05.

As depicted in Table 2, a one-way between subjects ANOVA was conducted to compare the effect on type of reflective experience on the raters’ domain mean scores. There was a significant difference in the type of reflective experience on raters’ domain mean score of communicating with students at the p<.05 level for the three experiences [F(2, 16) = 6.36, p = 0.009]. Post-hoc comparisons using the Tukey-Kramer HSD test indicated that the raters’ domain mean score for control group (written reflection only) (M = 1.70, SD = 0.11) was significantly different than Experimental group #1 (collaborative reflection) (M = 1.17, SD = 0.10). In addition, there was a significant difference in the impact of the type of reflective experience on raters’ domain mean score of flexibility during teaching at the p<.05 level for the three experiences [F(2, 16) = 4.88, p = 0.02]. Post hoc comparisons using the Tukey-Kramer HSD test indicated that the raters’ domain mean score for control group (written reflection only) (M = 1.53, SD = 0.09) was significantly different than experimental group #1 (collaborative reflection) (M = 1.15, SD = 0.08).

Finally, based on three focus groups, two major themes emerged from the analysis of the qualitative data. These categories are used as a framework for organizing the discussion. The themes will be discussed separately. However, they are not experienced independently of one another but holistically. The two major themes were reflection on the teaching experience and reflection on the process used. Content related to the identified themes are described next with direct quotations.

Reflection on the Teaching Experience

Participants in the control group and both experimental groups described in detail their reflection on their teaching experience. Participants pointed out the value in reflecting on their peer teaching demonstration. “It helped me to see things that I did or didn’t…did or didn’t flow well” [9]. Another participant agreed that reflection provided an opportunity to examine the overall effectiveness of the lesson. “…it just allowed us to see how things – what aspects went well and what didn’t go well…” [18:19]. The reflective experience helped the participants recall their teaching, and it helped them to validate the changes they felt they needed to make in future teaching. “After we taught, my partner and I had already seen what we really needed to change and started doing that. Then we watched the video – it reiterated and made me more confident about the changes we needed to make” [341:343]. Another participant expressed similar feelings. “I kind of noticed things that I hadn’t even thought that I wasn’t doing right. It showed me that I was doing things that I thought I was doing right the whole time” [440:442]. “…[the reflective experience] gives you a list of things you were working on…you could be consciously thinking ‘Okay, I’m trying to do this. I’m trying to do this’”
Additionally, as a result of the reflective experience, participants indicated they would change how they taught this particular lesson. “…it allowed us to see how we could alleviate those problems when we taught again” [20]. Participants also described specific changes they would make in their lesson as a result of the reflective experience. “We took one of the activities because we realized two of them were very similar and the students didn’t really understand the different between the two during the practice teach. We just combined them into one” [44:46]. Another participant also described a potential change to their lesson plan. “We had it broken up where one person did one activity and the next person did another activity. We found when that happened the other person was just standing in front of the room, so we modified it” [53:55].

Reflection on the Process Used

While the participants described the benefits of the reflective experience, there were notable differences in the experiences of the control group and the experimental groups. Specifically, control group participants described the benefits of completing only the written self-reflection form. “It just helped me to think about things in way that I hadn’t” stated one participant [82]. Another participant corroborated his or her colleague’s feelings. “I think writing in general kind of makes you to come full circle with your thoughts, so I think it just makes it more complete” [85:86]. Additionally, the written self-reflection process was described as beneficial. The form itself provided “structure,” and it gave the experience “organization.”

The use of a think-aloud process provided both benefits and challenges for the participants in Experimental Group #2. “I thought it was awkward at first,” stated a participant [146]. Others in the think-aloud group described this same sentiment. “Well, I thought it was awkward, and I was a little self-conscious,” one participant described [135]. They explained: “It was weird sitting there talking to the computer screen. You didn’t want someone to talk by…they might say ‘What’s she doing in there? Who is she talking to? Wait a minute. That’s just her in there taking to herself’” [240:243].

Even though participants expressed several challenges associated with thinking-aloud, they were able to express how the process helped them reflect. “…I didn’t mind it at all. It was actually kind of neat because there were no distractions. I could think about exactly I wanted to say and say it” [146:148]. Another participant described how the think-aloud process helped her elaborate upon her thinking. “It’s easy to elaborate upon yourself when you’re talking aloud rather than just writing it down…if you’re talking, you kinda come up with everything as you’re speaking. You keep diverging into it – keep coming up with newer ideas” [187:190]. The think-aloud process helped the participants process the peer teaching demonstration and helped them identify ways to change or improve their teaching. “…having to talk to yourself about it, just made you think or look back on what you did and what you could do better. It was kinda cool” [177:178]. Another participant anticipated the differences between using only a written self-reflection form and using a think-aloud process. “When you’re talking…it gives you more flow rather than just writing it down, which is what we normally do when we do reflection. Talking aloud and hearing yourself say something is different” [408:410].

The collaborative reflection experience participants (Experimental Group #1) also described the advantages of working with partner to reflect. Reflecting with a partner provided an opportunity for the participants to brainstorm how they could improve their teaching. “Me and my partner discussed all the things that we saw and all the things we can improve and change” [423:424]. Another participant described the same result of reflecting with a partner. “…we were able to, I guess, talk about it and come up with new ideas at the same time. I guess two heads are always better than one in coming up with new, creative ideas how to fix things” [584:586]. Additionally, the collaborative reflective experience provided an opportunity to gain another perspective on how the peer teaching demonstration went. “We could get both perspectives. ‘To me, it looks like I did bad. What do you think?’” [572:573]. By reflecting with a partner, the pre-service teachers indicated the reflection process was “easier,”
and it created more opportunities to figure out “…what we were going to fix for the next time” [546]. Although the collaborative reflective experience had notable benefits, it presented some challenges for the participants. The process was described as “distracting” and some felt it was difficult to focus during the experience. “It was kind of distracting to work with someone else because at the same time, we were laughing at ourselves. So that was kind of distracting…” [591:592].

Conclusions

The objective of this study was to determine the differences in depth of reflection for pre-service teachers when using individual reflection, individual reflection using a think-aloud protocol, and collaborative reflection. The conclusions of this study are not generalizable beyond the population in this particular study. We made the following conclusions based on the data collected. The findings support the idea that reflection is a valuable experience for pre-service teachers. As a result of reflecting upon their teaching, participants in both the control and experimental groups indentified changes they would make to the lesson plan and their teaching methods. “I definitely reflected on what I could have done better,” said one participant. “I really thought about the different things I did, and what I didn’t do” [64:65]. In fact, one pre-service teacher went as far to say that that reflection, “improved my teaching” [423]. Furthermore, the reflection process itself provided the pre-service teachers with structure and organization, which promoted deeper reflection. “Because [the reflection forms] had different sections, it made you reflect on the whole. It made me think about things that I could do differently,” described one participant [74:75]. Another pre-service teacher elaborated on how the structure of the process helped him/her reflect. “It gave me more ideas to reflect upon. I probably wouldn’t have thought of some of those questions or reflected on certain aspects of the lesson. The form helped me think about things that I probably would have [without them]” [93:94]. It can be concluded that reflection facilitated a consideration of change in teaching practices for the pre-service teachers in both the control and experimental groups.

The analysis of the written self-reflection forms revealed that the participants’ depth of reflection ranged from recall (R1) to the rationalization level (R2). The R1 level describes characteristics of “non-reflectors,” while the R2 level describes characteristics of “reflectors.” The mean scores for the written self-reflection forms ranged from 1.22 to 1.65. This indicates that the participants in this study merely described a simple awareness of what happened during their teaching. The participants referred to their thoughts and feelings, but they did not describe how or why those feelings developed. This was confirmed through the data generated from the focus group interviews. One participant described their awareness of their teaching. “I noticed that I’m not a very good describer of activities” [24]. Another pre-service teacher described a similar depth of reflection. “We had to change one of the games because we saw that it didn’t work at all. So we completely made a new system for selecting groups” [492:493]. However, some participants indicated depth of reflection in their written self-reflection forms. While thinking about why things happened, some pre-service teachers were also actively looking at the relationships between the “why” and creating guiding principles for future lessons. This is a characteristic of R2 reflection. This depth of reflection was illustrated by the data. “So after [teaching the lesson] – this was almost a week later that we saw it, I’d already been working on my lesson, thinking to myself ‘Well, I’m not gonna ask these questions anymore. I’m gonna do this – gonna ask these questions’” [333:334].

There was not a significant statistical difference between the mean scores of the written self-reflection forms of Experimental Group #1 (collaborative reflection) and Experimental Group #2 (reflection using think-aloud protocol). In fact, previous researchers have indicated that both methods promote deep processing (Corcoran, Narayan, & Moreland, 1988; Ericsson & Simon, 1998; Kim & Lee, 2002; Martin & Double, 1998; Nicholson & Bond, 2003; Sasaki, 2008). The qualitative data supported the conclusion that both methods enhanced the pre-service teachers’ reflective
experience. For example, one participant described the benefit of using a think-aloud process. “It was a way to be really honest when you critiqued your teaching. You didn’t have to say what somebody else wanted to hear. It was really way to be honest and really reflect” [184:185]. In addition, another participant discussed the benefit of reflecting collaboratively. “We could discuss what would be best for us. It was easier to collaborate and change the lesson since we did it together” [556].

The mean scores for the control group’s written self-reflection forms (M = 1.65) were higher than the collaborative group (M = 1.22) and think-aloud group (M = 1.47), thus indicating the control group had the greatest depth of reflection. With this in mind, it was also noted that the participants in both experimental groups described collaborative reflection and reflection using a think-aloud as distracting and awkward. For example, one participant recounted being uncomfortable using a think-aloud process. “It occurred to me that people could be walking by, seeing me talking to myself. I felt that as inhibiting” [136]. Another participant described the distracting nature of the think-aloud process. “I kinda forgot at times to say what I was thinking. I had to go back and catch up on what I was thinking” [154]. One pre-service teacher that reflected collaboratively also indicated being distracted. “[My partner and I] were like ‘Oh my gosh! I can’t believe we sound that way! That’s what we look like? That was distracting” [593:594]. As a result, We concluded that the distractions and awkwardness of collaborative reflection and the think-aloud process played a role in the level at which participants reflected. This was supported by the qualitative data as participants described the distracting nature of the collaborative reflection process and the awkwardness experienced during the think-aloud process.

Recommendations

Pre-service teachers should be provided with opportunities to reflect on their teaching throughout their teacher preparation program. This will help them identify ways they can improve their teaching in order to help students succeed. In this particular study, the pre-service teachers articulated how the reflective experience helped them improve their teaching. Furthermore, the participants expressed that the reflective experience will influence how they approach teaching in the future. “After we teach a class, we can go back in our lesson plans and write notes of things that we could change, things we liked, or things that went really well. Reflecting like that would be beneficial,” said one participant [516:518]. With that in mind, teacher educators should continue to embed reflective experiences into teacher preparation programs.

Working collaboratively and using a think-aloud process has been identified as a method that promotes greater cognitive and metacognitive processing (Corcoran, Narayan, & Moreland, 1988; Ericsson & Simon, 1998; Kim & Lee, 2002; Sasaki, 2008). With this in mind, pre-service teachers should be encouraged to utilize these methods when reflecting. However, as illustrated in this study, working collaboratively and using a think-aloud process can be distracting. Therefore, teacher educators should provide training for how to use both methods. The think-aloud process should be modeled, and pre-service teachers should be given the opportunity to practice the method before beginning the reflective experience. In addition, to fully understand the impact think-aloud protocols have on reflection, the think-aloud verbalizations can be recorded and transcribed. Analysis of the transcripts would help researchers understand which information the participants attended to, how they processed the information, and the manner in which they combined information to make decisions. Finally, in order to ensure the accuracy of the written self-reflection forms to what is actually experienced during collaborative reflection, the collaborative reflection experience should also be recorded and transcribed. This would help researchers determine if there was a discrepancy between what was verbalized and what was written on the reflection form. By doing so, the researcher would be able to determine if the depth of reflection (as indicated by the written self-reflection form) was influenced by working with a peer.
While this particular study was completed with pre-service teachers, we suggest future studies designed to examine the differences between pre-service and in-service teachers reflective experiences. Which would lead to greater depth of reflection for in-service teachers – individual reflection, individual reflection using a think-aloud protocol, or collaborative reflection? This particular line of inquiry could help maximize the reflective experiences of in-service teachers and continue to promote the idea of a reflective practitioner within classrooms.

References


CORY M. EPLER is the Deputy Director for Nebraska Career Education within the Nebraska Department of Education, 301 Centennial Mall South, Lincoln, NE, 68509, cory.epler@nebraska.gov.

TIFFANY A. DRAPE is a Project Associate within the Office of Educational Research and Outreach at Virginia Tech, 217 East Eggleston, Blacksburg, VA, 24061, tdrape@vt.edu.

THOMAS W. BROYLES is an Assistant Professor in the Department of Agricultural and Extension Education at Virginia Tech, 268 Litton-Reeves Hall, Blacksburg, VA, 24061, tbroyles@vt.edu.

RICK D. RUDD is a Professor in the Department of Agricultural and Extension Education at Virginia Tech, 2270 Litton-Reeves Hall, Blacksburg, VA, 24061, rrudd@vt.edu.
The History of Future Farmer Organizations Around the World

James J. Connors
University of Idaho

The establishment of the Future Farmers of America in 1928 and its subsequent growth in size and scope was noticed around the world. Agricultural education professionals from dozens of other countries wanted to know about the organization and how it helped motivate young rural boys to study vocational agriculture and choose agriculture as a career field. Over the course of several decades, many countries started their own “future farmer” organizations. The most successful was the Future Farmers of Japan, which is a large and vibrant organization to this day. As the FFA grew, so did its involvement in international activities. The FFA has worked with many other countries to offer exchange programs, study tours, and travel seminars for state FFA officers, award winners, and national FFA officer teams. The FFA has also offered Work Experience Abroad, World Experience in Agriculture, and the World AgriScience Studies Programs. This historical research study investigated future farmers’ organizations in other countries, the history of FFA international activities, and study tours and travel seminars for award winners and FFA officers.

Keywords: Future Farmers of America, International, History

The Future Farmers of America organization has been involved in international activities since it was established in 1928 (Tenney, 1977). Even before the FFA was founded, American agricultural education professionals were traveling to remote corners of the world to offer advice and recommendations on agricultural education and youth development to other countries (Allen, 1939; Dickinson, 1947). As the Future Farmers of America grew in size and scope, agricultural educators from around the world took notice of the impact the organization was having with rural agricultural youth in the United States.

Government officials, agricultural educators, and international development organizations began contacting the Future Farmers of America to find out details about FFA programs, activities, and events. So many countries were contacting the FFA that the organization developed a brochure titled “The Future Farmers of America: What it is, What it does” (Future Farmers of America, n.d.) that was printed in English, Spanish, Portuguese, and German. Educators around the world were realizing how future farmers’ clubs could be used to organize and motivate youth to study agricultural education and enter the field of agriculture.

Over the period of several decades, numerous other countries established “Future Farmer” organizations for their youth. In many countries the name “Future Farmers of...” was used. In other countries, different names were used for youth agricultural education clubs. Regardless of the final name chosen, similar symbols, rituals, skill development events, and leadership development activities were included in these organizations. This study investigated the Future Farmers of America’s long history in international agricultural education activities, including the establishment of Future Farmers’ clubs in other countries around the world.

Theoretical Framework

Agricultural education professionals from the United States have been working in other countries for decades. Sherman Dickinson was the Chief of Party in the Brazil Cooperative Agricultural Program in the late 1940s. Writing in The Agricultural Education Magazine, Dickinson (1947) stated,
Our program in agricultural education is attempting to cooperate with the Brazilian Ministry of Agriculture in developing plans whereby the agricultural situation may be improved. It has been agreed that this may be best accomplished by means of increased educational opportunities for rural peoples, emphasizing training in practical agriculture (p. 237).

The Future Farmers of America wasn't the only organization of interest for other countries. The 4-H youth clubs were also involved internationally since their development in the early 1900s. Smith and Kirkpatrick (1990) reported that “Long before the International Farm Youth Exchange (IFYE) program was initiated in 1948, the 4-H movement in America had won the interest and respect of several foreign nations” (p. 150). The authors also reported that, “As early as the 1920s and 1930s, Canada, England and a few other countries set out to develop similar youth groups” (p. 150). Over the next decades, 4-H clubs were established around the world. Smith and Kirkpatrick wrote that,

By the late 1940s, South Korea had established a 4-H type program with some 3,729 clubs and 142,500 members. And in 1949, Austria launched a program similar to 4-H as part of the Marshall Plan. By 1953, 23 countries in Asia, Europe and Latin America had 4-H type clubs. (p. 150).

Reck (1951) described the beginning of 4-H clubs in Denmark by stating, “Denmark had been working with rural young people since 1913, when agricultural societies organized farm boys into groups to receive technical instruction” (p. 221). Denmark made arrangements to host a USDA extension specialist to assist in establishing 4-H clubs. Meetings were held throughout 1923-24 and “club work actively started in the spring of 1924” (p. 221). Reck (1951) reported that, “They adopted the four-leaf clover and the four H’s, the letters in this case standing for Hoved, Hjerte, Haand, and Helbred, the Danish words for head, heart, hand and health”(p. 221).

The issue of educating rural youth in developing countries is one that is not new in international development. Finley and Price (1994) wrote that “rural young people is another group that had received too little attention in agricultural extension programs. Millions of young people living in rural areas are a significant and untapped resource” (p. 238). The authors went on to write that, “Rural youth has a widespread need for practical training in agriculture...special efforts are needed in agricultural education, extension education, and training to include a higher proportion of rural young women” (p. 238).

When the Soviet Union occupied the Baltic State of Lithuania in 1940, they closed the long established Lithuanian Chamber of Agriculture and its affiliate Lithuanian Young Farmers Circles Union. The Lithuanian Chamber of Agriculture was originally founded in 1926 (Lithuanian Chamber of Agriculture, n.d.). The mission of the LCA is to be the main supporter of the viability of rural society and raise a strong, motivated and independent person, able to develop a competitive agriculture and to maintain safe and attractive living environment. According to Edwards, Thuemmel, and Kisieliene (2000), “In February 1989...a conference of young farmers was held at which time it was decided to ‘restore’ Young Farmers’ Circles in Lithuania” (p. 18)

Throughout the late 1980s and early 1990s, there was a strong emphasis on incorporating international agriculture concepts into secondary agricultural education curricula in the United States. In 1989, Martin wrote about the global perspective for agricultural education. He suggested that agriculture students should get involved in the Work Experience Abroad program, teachers should be involved in travel/work experience overseas, and that agriculture teachers should develop an exchange system with a school in another country.

In another article, Martin (1993) wrote a rationale for internationalizing agricultural education. His selected activities to internationalize agricultural education programs included a recommendation that FFA should “help establish/enhance youth organizations in other countries” (p. 21). He also suggested that the FFA develop youth leadership camps in other countries around the world. Martin concluded by stating, “There is a tremendous
international frontier waiting for development of programs modeled after agricultural education/FFA as we know it in the U.S.A.” (p. 22).

Writing about the need for rural youth development around the world, Lindley (1989) stated, “Youth activities and competitions at the national, regional, and international level are almost non-existent in the developing countries. Support and promotion of international youth exchanges among developing countries would provide opportunities for leadership development for rural youth” (p. 13) Lindley gave several examples of youth components in rural development programs including:

The organization and guidance of rural youth for leadership development, skill training, service and production purposes. This includes the formation of youth clubs such as 4-H in the USA, Tani Tasuna (future farmers’ groups) in Indonesia, Anak Bukid (farm youth clubs) in the Philippines, rural youth clubs in South Korea, 4-S in Swaziland, 4-K in Kenya through the agricultural extension services.” (p. 14)

Agricultural education professionals in the United States, have been involved in international activities for almost a century. They have worked in distant countries to develop their agricultural education systems. They have worked to infuse leadership development activities for rural youth in poor, developing countries, and they have worked to incorporate international agricultural concepts into domestic agricultural education curricula. The establishment of future farmers’ clubs in other countries is just one way that American agricultural education has worked to improve agricultural education and youth leadership development around the world.

**Purpose and Objectives**

The purpose of this historical research study was to document the history of future farmers’ organizations around the world. Specific objectives which directed the study included:

1. Document the interest in, and establishment of, future farmers’ youth organizations in other countries.
2. Describe the history of international activities within the National FFA Organization.
3. Describe the history of the international travel seminars for National FFA Officers, state FFA officers, and national award winners.

**Methods**

This study was a historical research investigation. McDowell (2002) stated that, “Historians examine the past so that we may have a better understanding of the content of past events and the context in which they took place” (p. 4). I utilized historical research methods to address the purpose and objectives of the study. Borg and Gall (1983) wrote that, “Historical research involves the systematic search for documents and other sources that contain facts relating to the historian’s questions about the past” (p. 800). Research was conducted at the National FFA Archives at Indiana University ~ Purdue University, Indianapolis, at land-grant university libraries, and departments of agricultural education libraries. Whenever possible, primary sources were utilized. Primary sources included magazine articles, journal articles, meeting notes, and personal communications in the form of original source letters available at the National FFA Archives. Secondary sources of information included books, convention proceedings, and periodical articles (Ary, Jacobs, Razavieh, & Sorensen, 2006).

In every case, I exposed the historical documents to external and internal criticism to determine their value in addressing the objectives of the study. I examined each document thoroughly to ascertain if it was authentic and authored by the individual whose name appeared on the document. I then examined the content of the document to establish internal criticism. I evaluated the document to determine the worth of the evidence and whether it provided a true report of the historical event. I also attempted to triangulate information from several sources, both personal
notes, minutes, and secondary reports of activities.

One limitation of this study was my inability to determine the current status of future farmers’ youth organizations in other countries. This objective, which would provide valuable information, was unfortunately outside the scope of this study.

Results

Shortly after the FFA was organized, agricultural educators, FFA advisors, and members began traveling the world to promote youth development through Future Farmers’ clubs. In a summary report on International Programs (Tenney, 1977), it was written that, some pioneering work was done in many countries, including Albania, Greece, Egypt, India, Korea, Thailand, Taiwan, Japan, Philippines, South Viet Nam, Honduras, Canada, South Australia, Peru, Columbia, Brazil, and Mexico. (p. 119)

The National FFA Archives contains hundreds of letters from government officials, educational professionals, and community organizations from around the world requesting information about the FFA. The following is a sample of some of the countries from which letters were received:

<table>
<thead>
<tr>
<th>Bavaria (Germany)</th>
<th>Brazil</th>
<th>Ceylon (Sri Lanka)</th>
<th>Cyprus</th>
<th>Denmark</th>
</tr>
</thead>
<tbody>
<tr>
<td>France</td>
<td>Germany</td>
<td>India</td>
<td>Ireland</td>
<td>Israel</td>
</tr>
<tr>
<td>Malaya</td>
<td>Morocco</td>
<td>Philippines</td>
<td>Sweden</td>
<td>Trinidad-Tobago</td>
</tr>
</tbody>
</table>

Figure 1. Countries from which request letters were received

Future Farmers of Greece

In 1935, Adams reported that the Future Farmers of Greece was being organized in the Mediterranean country. The American Near East Foundation was working with the Greek government to develop a youth organization. Adams wrote that,

Consequently, the first ‘Future Farmers of Greece’ organization had its beginning. A national chapter was written up by the supervisors of the Near East Foundation work, and presented to the Greek courts for approval in accordance with Greek law. By the end of 1933, two chapters had been organized and some experience gained in developing rounded out long-time programs of work. (p. 190)

Adams reported, “In 1934, five new clubs were organized making a total of seven chapters, with an enrollment of 140 boys” (p. 190). The FFG chapters “organized its yearly programs along four lines - recreation, agriculture, cultural improvement and health sanitation” (p. 190).

At the 11th Annual National FFA Convention in October 1938, Dr. H. B. Allen (1939), Director of Education for the Near East Foundation, delivered an address titled “Future Farmers in Other Lands.” Allen stated, “I bring you greetings and best wishes from the Future Farmers of Greece, the Future Farmers of Bulgaria, and the Progressive Farmers of Albania” (p. 236). Allen expressed his thanks to the Future Farmers when he stated, “In developing your fine organization during the past 11 years, you, and others before you, have built much better than you knew; the influence of your high ideals and sound principles is much wider than you realize” (p. 236).

Future Farmers of Japan

Immediately following World War II, America was actively involved with rebuilding the country of Japan. Efforts were being made
to improve the educational institutions across Japan. In order to improve agricultural education programs, the Future Farmers of Japan was created in 1950. Tenney (1977) stated, "George Lewis, former national president of the FFA, made a report at the 1951 FFA convention on his visit with the Future Farmers of Japan. It was reported that Ivan Nelson, a former teacher of vocational agriculture attached to General MacArthur’s staff in the Army of Occupation, had been influential in the development of the Future Farmers of Japan." (p. 119 & 120).

Meaders (1985) reported that the FFJ, "...continues as a strong youth organization for boys and girls who are students of vocational agriculture. Its three goals of leadership, social character, and scientific character have provided a focus for promoting agricultural education” (p. 11).

**Future Farmers of Canada**

Immediately following World War II, agricultural education was expanding rapidly in Canada as in the United States. The Future Farmers of Canada organization was created in January 1947. One of the first chapters of the FFC was the Creston Valley chapter from Creston, British Columbia. The National FFA Archives contains copies of the FFC Creed and Bylaws. Figure 2 below contains the Creed of the Future Farmers of Canada.

**Creed of the Future Farmers of Canada**

I believe in the future of farming and that life on a farm is both honorable and satisfying.

I believe that success in farming comes through a scientific attitude, efficiency, hard work and determination.

I believe in being a good citizen...honest and fair in all my dealings.

I believe in accepting responsibilities and doing my part in my home, school and community.

I believe that serving my country, helping others, and doing my best in my vocation will lead to a happier, fuller life.

*Figure 2. Creed of the Future Farmers of Canada*

The Future Farmers of Canada adopted a crest as its emblem. The crest consisted of a tree, a plow, a maple leaf, and the sun. The tree symbolized growth, the plow labour in agriculture, the maple leaf represented Canadian heritage, and the rising sun represented the future. The FFC included three degrees; Farmhand (bronze), Chapter Farmer (silver), and Provincial Farmer (gold). According to Tenney (1977), “The Future Farmers of Canada sent representatives to the national FFA conventions in 1952 and 1953” (p. 120) and in 1954 the Canadian Ambassador to the United States was a speaker at the convention.

**Future Farmers in Southeast Asia and the Pacific**

The Future Farmers of the Philippines was established in 1953. Many of the components of the FFP were adopted from the Future Farmers of America. In a letter to the Supervisor of Agricultural Education in the Philippines (Tenney, A.W., 1950-1957, Tenney to A.G.
Matela, March 7, 1949) Tenney wrote, “This is to advise that you have our permission to use the materials in our Official Manual and other items which may be appropriate for you to use in the Philippines. We can see no objection to your using these since your organization will be the Future Farmers of the Philippines.”

FFP officers include the President, Vice President, Secretary, Treasurer, Press Relations Officer [Reporter], Sergeant-at-Arms [Sentinel], and Advisor. The emblem of the FFP is shown in Figure 3 below. It includes eight symbols including rising sun, plow, owl, crops, and flag which are similar to symbols on the FFA emblem. It also includes the words Future Farmers of the Philippines, FFP, Vocational Agriculture and 1953, the year FFP was founded. The degrees of membership in the FFP are Greenhand (bronze), Chapter Farmer (silver), District Farmer (gold pin), Filipino Farmer (gold key). The organization also had the Master Filipino Farmer of the Year, Honorary Chapter Farmers, Honorary Filipino Farmers, and Collegiate FFP members (Future Farmers of the Philippines, 1959).

Figure 3 below contains the emblem of the Future Farmers of the Philippines. Table 1 lists the emblem symbol, the office it represents and the description of the symbol’s meaning.
Table 1
Future Farmer of the Philippines' Emblem Symbols and Their Meaning (FFP, 1959)

<table>
<thead>
<tr>
<th>Emblem Symbol</th>
<th>Associated Office</th>
<th>Description</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rising Sun</td>
<td>President</td>
<td>Progress, skills, enlightenment and the token of a new era in agriculture, brotherhood, and cooperation. labor, industry and tillage of the soil as well as agriculture which is the basic industry of the Filipino people. Wealth and economic stability of the nation</td>
<td></td>
</tr>
<tr>
<td>Plow</td>
<td>Vice President</td>
<td></td>
<td>National unity because as a patriot and as a farmer he kept accurate records of his business and his activities to guide his countrymen.</td>
</tr>
<tr>
<td>Rice and other crops</td>
<td>Secretary</td>
<td>Wealth and economic stability of the nation</td>
<td></td>
</tr>
<tr>
<td>Picture of Jose P. Rizal</td>
<td>Treasurer</td>
<td></td>
<td>Loyalty and unity of purpose</td>
</tr>
<tr>
<td>Filipino flag</td>
<td>Press Relation Officer (Reporter)</td>
<td></td>
<td>Strength of the nation and the national scope of the organization.</td>
</tr>
<tr>
<td>Head of a Carabao</td>
<td>Sergeant-at-Arms</td>
<td></td>
<td>Knowledge and time-honored wisdom</td>
</tr>
<tr>
<td>Owl</td>
<td>Advisor</td>
<td></td>
<td>Learning and the records of achievements of the nation</td>
</tr>
<tr>
<td>Book with Torch</td>
<td>--------</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The Future Farmers of Australia was probably established in the early 1950s. In October 1950 Tenney (Tenney, A.W., 1950-1957, Tenney to A.R. Ninnes, October 24, 1950) wrote to the Advisory Teacher of Agriculture at the South Australia Department of Agriculture, stating, “It would not be a difficult undertaking to organize the Future Farmers of Australia. The first step would be to study the official manual of our organization and revise it so that it would meet your needs.” In a subsequent letter (Tenney, A.W., 1950-1957, Tenney to A.R. Ninnes, July 10, 1953), Tenney wrote, “We are very glad to learn of the development and growth of the Future Farmers of Australia. It is significant that you are holding a State Convention the first week of September” [1953]. In late 1955, a high school principal in American Samoa requested permission to establish an FFA chapter. Tenney (Tenney, A.W., 1950-1957, Tenney to M.J. Senter, December 30, 1955) wrote that, students enrolled in high school in Samoa will not be eligible to take part in contests sponsored for and by the Future Farmers of America. Tenney explained that, The Congress of the United States extended our program a few years ago that made possible a working relationship with Hawaii [not yet a state] and Puerto Rico. We are not in a position to assist you officially until the authorization is given by the Congress to extend the program to Samoa. Tenney even suggested that, “If you wish to organize the Future Farmers of Samoa, we shall be very glad to provide complimentary copies of appropriate literature for you to use.” At the same time interest was expressed by vocational agriculture teachers on the island of Guam to establish Future Farmers’ chapters. In 1956, Tenney (Tenney, A.W., 1950-1957, Tenney to H.P. Adelbai, December 19, 1956) wrote that “I am interested to learn in your letter of November 29, that you want to form a chapter of the Future Farmers of America on Guam. I regret to advise that at the present time the vocational
agriculture department in Guam is not qualified to have an FFA chapter that can affiliate with the national organization.”

This was because at that time the National Vocational Education Act did not include Guam.

Future Farmers in Africa and the Middle East

The National FFA Archives includes letters referencing the Future Farmers of Liberia (Tenney, A.W., 1950-1957, Tenney to F.B. Sands, March 14, 1955), the Young Farmers of South Rhodesia (Tenney, A.W., 1950-1957, Tenney to D. E. Baker, May 19, 1952), and the Future Farmers of Israel (Tenney, A.W., 1950-1957, Tenney to M. Aloni, October 26, 1955). Letters indicate that a chapter of the Future Farmers of Israel was established at Givat Ada. Letters were also found from officials in Iraq in reference to future plans to create “an appropriate youth organization in the field of agriculture” (Tenney, A.W., 1950-1957, Tenney to J. H. Lintner, June 5, 1957). Other documents were found that referred to the Future Farmers of Egypt but no additional information about this organization was located.

Future Farmers in Central and South America

Several future farmers’ organizations were established in Central and South America. The Future Farmers of Panama was established in 1955. The official name of the organization is Asociación Nacional de Futuros Agricultores de Panamá. In 1960, E.J. Johnson, Program Planning Specialist in the U.S. Agricultural Education Branch, visited Peru to help officials develop the Future Farmers of Peru. The FFP even received permission from the FFA to have the official FFA manual translated into Spanish for the use of its members (Tenney, A.W., 1950-1957, Tenney to J. G. Coombs, April 7, 1955).

The agenda for the Committee on International Educational Activities for the Future Farmers of America (1967) meeting included references to the Future Farmers of Mexico, Future Farmers of Colombia, the Future Farmers of Peru, and the Future Farmers of Costa Rica. The committee recommended to “develop guidelines to outline how the FFA would be used to supplement agricultural education programs in other countries, and recommended conducting a “World FFA Seminar” in 1970 (Future Farmers of America, 1967).

International Programs

In 1947, the National FFA Officers invited Lord Inverchapel, Ambassador from Great Britain to address the national convention (Tenney, 1977). Accompanying him on his trip to Kansas City were six members of the National Federation of Young Farmers Clubs of Great Britain. At the same time six FFA members traveled to Britain for a tour. This led to the development of an international exchange program between the two organizations. It was reported in the FFA at 25 booklet (Farrar, 1956).

One of the convention activities was the approval of a plan for establishing an annual exchange program between the FFA and the Young Farmers Clubs of Great Britain. Four Future Farmers made the trip to Britain in 1949 and four British Young Farmers came to this country. (p. 41)

This exchange program continued for many years. In the history book Blue Jackets Gold Standards (National FFA Organization, 2003), it was stated that, “Two 18-year-olds represented FFA in the organization’s British Exchange Program in 1953. David Boyne, Marlette, Michigan, and L. Philip Brouillette...Richford, Vermont, spent four summer months that year in Great Britain visiting in homes of young farmers” (p. 26).

In 1963, the FFA contracted with the Peace Corps to sponsor agricultural development projects in West Pakistan. A.W. Tenney traveled to West Pakistan in 1965 to observe the projects and meet the FFA members who volunteered to spend two years working in the country (Tenney, 1965). Building on the FFA’s success with exchange programs, the FFA Work Experience Program was developed in 1969. This program would later be called Work.
Experience Abroad, and World Experience in Agriculture. Other international activities in which the FFA participated included the Congress/Budestag Exchange Program in West Germany, and the World AgriScience Studies Program (“Making the Grade Across the Ocean,” 1988).

Throughout the 1960s and 1970s, FFA involvement in international agricultural education continued to grow. Joe Martinez, 1968-69 National FFA Vice President, journeyed to Cali, Columbia to represent FFA at the 1969 National Convention of the Future Farmers of Columbia. Martinez’s (1969) speech included the following passage,

It was interesting to me to note that your liberator, Simon Bolivar, whom you regard as the Father of your nation is symbolic of the Treasurer’s post in the FAC, just as George Washington, the Father of our nation is symbolic of the FFA Treasurer. Your reference to Bolivar and the respect you show your country and its leaders is indicative to me that the FAC like the FFA seeks to encourage patriotism for country and fellow man.

The Future Farmers of America also got involved in improving production agriculture practices in foreign countries. In 1972, the FFA worked with the Iowa FFA Association to develop a swine improvement program in Jamaica (Tenney, 1977, International Programs, n.d.). Tenney (1977) reported that,

After Lennie Gamage and Tim Burke, national FFA president in 1972, visited the Youth Development Agency and Youth Clubs in Jamaica, the FFA offered to provide high quality, purebred swine to be given to the youth camps in Jamaica to launch a pig chain to upgrade swine (p. 122).

In 1973, Lennie Gamage, former National FFA Officer, and Director of FFA International Programs, traveled to Australia to deliver the keynote speech titled “FFAustralia” to the 1973 convention of the Future Farmers of Australia (Tenney, 1977). In 1974, H. Nevil Hunsicker traveled to Medellin, Columbia to deliver a speech titled “The Role of Vocational Agriculture and Future Farmers Programs in Rural Development” to the First General Meeting of the Committee on Interamericano de Educación Agrícola (Hunsicker, 1974a). On the same trip Hunsicker gave another speech titled “The Role of Student Organizations in Vocational Agricultural Education” to the 5th National Convention of Futuros Agriculturoes de Columbia (Hunsicker, 1974b).

Over the decades, FFA continued to reach out to international organizations to offer international exchange programs to send FFA members to other countries, and bring young agriculture students to the United States. In 1989, the FFA International Department organized the “Experience America” program (El Salvador Students Experience America, 1989). One hundred El Salvador high school students traveled to the USA and spent two weeks with FFA families in California, Illinois, Iowa, Kentucky, Louisiana, Nebraska, New Mexico, Ohio, Oregon, South Dakota, Virginia, and Wisconsin. The project was sponsored by Partners, a non-profit organization dedicated to furthering understanding of Central American and Caribbean countries.

International Travel Seminars

Throughout the 1960s and 1970s, the FFA began offering international study tours to Central and Eastern Europe, Australia and New Zealand, Central and Northern Europe, and South America. In the early 1970s, Lennie Gamage offered study tours to New Zealand, Thailand, the Philippines, Iran, Japan and Korea. The first World Conference in Agricultural Education for Youth and Adult Leaders was held in conjunction with the 1976 National FFA Convention. One of the major activities of the conference was the First International Agricultural Olympics “consisting of individual competitive activities in soil and plant judging, agricultural mechanics, tractor operation and maintenance, and livestock judging” (Tenney, 1977, p. 124).

In 1978-79, the national FFA organization created the Proficiency Travel Seminar for the finalists and winners of the national FFA Proficiency Awards. The first seminar took place in March 1979. Countries visited over the years included England, France, Belgium,
Luxembourg, West Germany, Liechtenstein, Austria, Hungary, Italy, Switzerland, Czechoslovakia (later the Czech Republic and Slovakia), Poland, Sweden, Finland, Denmark, the Netherlands, and Ireland. In the late 1980s, the FFA developed the Stars on Tour program (Mattics, 1988). It included the finalisists for the Star Farmer of America and Star Agribusinessman of America. These two travel seminars were eventually combined to include both the star finalists and the proficiency finalists. In 1999, the FFA established the International Leadership Seminar for State Officers. This trip introduces State FFA Officers to international agricultural production and leadership development opportunities in Europe.

Eventually, state FFA associations and local chapters began participating in international programs. In the early 1990s, several chapters from across the country participated in the Russian exchange program with agricultural schools in the Russian Federation (former Soviet Union) (Zillinger, 1995). Six Pennsylvania FFA members from the Williamsburg chapter participated in a six-month Poland Exchange Program in 1994 (Bruce, 1995).

Throughout the decades, the National FFA Officers also got a chance to experience international agricultural education. The National Officer Good Will Tour to visit FFA Foundation Sponsors began in 1947. In the 1980s this trip was expanded into the International Experience Tour for National Officers and included a trip to Japan sponsored by Mitsui & Company, a major Japanese trading company. The 1989 National Officers tour traveled to Japan, Thailand, and China. “The officers also met with members of the Future Farmers of Japan and the Future Farmers of Thailand (“West Meets East,” 1989, p. 12).

Conclusions and Recommendations

The establishment of the Future Farmers of America in 1928 and its subsequent growth in size and scope was noticed around the world. Agricultural education professionals from dozens of other countries wanted to know about the organization and how it helped motivate young rural boys to study vocational agriculture and choose agriculture as a career field. Over the course of several decades, many countries started their own “future farmer” organizations. The most successful was the Future Farmers of Japan which is a large and vibrant organization to this day. As the FFA grew, so did its involvement in international activities.

Based on the results of this historical research study, it can be concluded that the Future Farmers of America organization played a vital role in helping to establish similar “future farmer” youth organizations in numerous countries around the world.

The FFA has worked with many other countries to offer exchange programs, study tours, and travel seminars for state FFA officers, award winners, and national FFA officer teams. The FFA has also offered Work Experience Abroad, World Experience in Agriculture, and the World AgriScience Studies Programs. This research found that international agricultural education activities have been a major component in the 82 year history of the Future Farmers of America and the National FFA Organization. FFA leaders, staff, national officers, advisors, and members have traveled the world to offer assistance, gain valuable international work experience, or study agricultural production, policy, and culture in numerous countries in every corner of the globe.

Based on these conclusions, I recommends that a comprehensive assessment of worldwide agricultural education programs should be conducted. Sources of information for such an assessment would be Ministries of Education and offices of vocational education in countries to determine the status of their agricultural education programs and agricultural youth organizations such as future farmers’ and young farmers’ clubs. The National FFA Organization should reconstitute the Committee on International Educational Activities. It should work to consolidate all information about agricultural education/FFA involvement in international agricultural activities and make regular reports to the National Association for Agricultural Education (NAAE), American Association for Agricultural Education (AAAE), the National Association of Supervisors of Agricultural Education (NASAE), and at National Ag Ed Summit meetings. The National
Council for Agricultural Education should work with FFA International Activities officials to organize and lead a revised emphasis on international agricultural education and future farmer organizations for the youth of the world.

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JAMES J. CONNORS is Department Chair and Associate Professor in Agricultural Education & 4-H Youth Development at the University of Idaho, 1134 West 6th Street, Moscow, Idaho 83844-2040, jconnors@uidaho.edu.
Leadership Curriculum and Materials Used by High School Agricultural Science Teachers: A National Study of the Pre-LifeKnowledge Days

A. Christian Morgan
Nicholas E. Fuhrman
Diana L. King
Frank B. Flanders
University of Georgia
Rick D. Rudd, Professor
Virginia Tech University

Agricultural science programs have provided many opportunities for leadership education through classroom, supervised agricultural experience (SAE), and FFA Organization activities. Past studies have focused on leadership developed through activities such as career development events (CDE), SAE activities, FFA Organization conventions, and other intra-curricular activities; however, little research has focused on the type of leadership curriculum and materials used to teach leadership in agricultural science classrooms. This study used a qualitative survey to determine what leadership curriculum and materials were being used by agricultural science teachers to teach leadership prior to the release of the LifeKnowledge curriculum. To understand the impact of LifeKnowledge in follow-up studies, a baseline must first be established for comparison. This study found that agricultural science instructors used a wide variety of curriculum and resources to teach leadership. The most popular resources being used were text books and state provided curriculum materials; however, no single curriculum was used by the majority of participants. Some participants indicated using curriculum and resources to teach leadership which contained little, if any, leadership content. Agricultural science instructors may have mixed views on the definition of the term “leadership,” therefore additional research is needed to determine how agricultural science instructors define leadership and the methods they use to build leadership skills in their students.

Keywords: leadership curriculum, secondary agricultural education, LifeKnowledge

Leadership skills are not only desired by employers, but needed for a productive and “functional” society (Brooks et al., 2008; Gardner, 1990; Kouzes & Posner, 2007). To help meet this need, leadership has been taught in high schools through a variety of venues, including leadership courses, career and technical student organizations, student councils, and other school-based organizations. Within career and technical education, agricultural science courses have provided many opportunities for leadership education through classroom, supervised agricultural experience (SAE) projects, and FFA Organization activities. While studies have sought to determine leadership abilities attributed to involvement in SAE and FFA Organization activities, little has been done to assess what leadership education is occurring in the agricultural science classroom. In 2004, the National FFA Organization sought to improve the leadership instruction within agricultural education by developing the LifeKnowledge curriculum (LifeKnowledge, 2011). However, before the impact of LifeKnowledge can be assessed, a baseline must first be established for comparison. This study sought to capture data on the leadership materials being used by agricultural science instructors prior to 2004. With knowledge of the curriculum materials being used to teach
leadership in agricultural education classrooms prior to LifeKnowledge, it will be possible for future research to accurately assess the impacts of LifeKnowledge.

Leadership development is becoming a focus of many public schools across the country, and in a few cases schools and school districts have designed and implemented curriculum in order to teach leadership knowledge and skills to youth (Commonwealth of Virginia Board of Education, 2001; School District of Washington, 2001; University of Texas of the Permian Basin, 2009; Virginia Division of Policy and Public Affairs, 2001; Vital, 2007). Prior to this trend, Gardner (1990) documented that leaders are needed in all levels of our society, while Figura (1999) warned of an impending leadership void among the workforce. Indeed, students who have been taught leadership are better prepared to act in a leadership capacity because they better understand the phenomena of leadership as a personal and attainable undertaking (Ricketts & Rudd, 2002). If a goal of high school education is to produce capable citizen leaders, it is natural that leadership should be part of the curriculum.

Leadership Development in High Schools

Public secondary schools have a history of providing programs for leadership development. In addition to student councils, debate clubs, and other on-campus organizations, many high school career and technical programs develop leadership skills in students through a variety of activities such as the National FFA Organization, Family, Career and Community Leaders of America (FCCLA), Distributive Education Clubs of America (DECA), and SkillsUSA (White, 1982). Specific to agricultural science programs, the National FFA Organization has worked hand-in-hand with agricultural science teachers, providing an avenue for young people to exercise and develop their leadership skills (National FFA Organization, 2011). The FFA mission statement asserts the goal of the organization is to “…make a positive difference in the lives of students by developing their potential for premier leadership, personal growth, and career success through agricultural education” (National FFA Organization, 2011, para. 1).

There is a unique link between high school agricultural science programs and the intra-curricular National FFA Organization. Within these classrooms, agricultural science instructors teach leadership skills to students, who then apply that knowledge by engaging in leadership activities provided through local, district, state, and national activities (Hughes & Barrick, 1993). Agricultural science programs provide a wide variety of opportunities for leadership development during classroom instruction, SAEs, and FFA activities (Hillison & Bryant, 2001; Hoover, Scholl, Dunigan, & Mamontova, 2007) which, according to the Agricultural Education Program Model, is integral to preparing students for further education and employment (Hughes & Barrick, 1993). However, little is known about the curriculum and materials being used in the high school classroom to teach leadership.

Student FFA Involvement

A substantial amount of research has been conducted to analyze the impact of FFA involvement on students over the past three decades. Townsend and Carter (1983) found student self-perceived leadership competencies had a significant correlation with FFA participation, and their results suggest leadership is enhanced with increased FFA activity. In addition, Ricketts and Newcomb (1984) surveyed high school students and discovered that students enrolled in agricultural courses and who were FFA members possessed significantly more leadership and personal development abilities than did students not enrolled in agricultural courses.

The relationship between FFA involvement and leadership development is strong. Ricketts and Newcomb (1984) and later Wingenbach (1995) found member engagement within the local FFA chapter had a significant positive relationship with self-perceived youth leadership and life skill development. Likewise Rutherford, Townsend, Briers, Cummins, and Conrad (2002) surveyed FFA chapter officers attending the National FFA Organization’s Washington Leadership Conference (WLC) and
found a significant positive relationship between self-perceived leadership skills and level of FFA involvement. This positive correlation reinforces the positive relationship between FFA activity and perceived leadership skills. Similarly, a three-year longitudinal study revealed that the WLC had a positive impact on student attendees (Stedman, Rutherford, Rosser, & Elbert, 2009). Further, Anderson and Kim (2009) found that students preferred the school-based leadership training found in FFA and agricultural science classes second only to high school sports.

The preceding studies help to illustrate the benefits of youth involvement in extra-curricular and intra-curricular activities, especially in the development of leadership skills. However, not all students engage in these activities. The conceptual model used in this study was Finch and Crunkilton’s (1999) Program System Model (Figure 1) which illustrates how students (input) enter a secondary program (process), and then graduate from this program (output). The secondary program consists of four elements: faculty, resources, curriculum, and intra-curricular activities. Within agricultural science programs, the presentation of leadership concepts and the development of leadership skills rely heavily on these four elements; yet, if students are not participating in extra- and intra-curricular activities, classroom leadership instruction will be the process by which they develop leadership skills. Specific classroom instruction in leadership would provide leadership exposure for all students, regardless of participation in leadership activities, and aid in developing suitable levels of leadership skills in high school students (Carter & Spotanski, 1989; Ricketts & Rudd, 2001). This study sought to expand the understanding of the process component of the Finch and Crunkilton (1999) model prior to the release of the LifeKnowledge curriculum.

There are leadership textbooks designed for use in agriscience programs (Cengage, 2011; Pearson, 2011), and some states have developed leadership curriculum (Commonwealth of Virginia Board of Education, 2001; Instructional Materials Service, 2011; North Carolina State University, 2011; Virginia Division of Policy and Public Affairs, 2001) to address local needs. Although agricultural education has accepted the charge to teach leadership skills, no studies have been conducted to determine what curriculum has been used in agricultural science classrooms prior to the release of the LifeKnowledge curriculum.

Figure 1. Program System Model. From Finch and Crunkilton, 1999, Curriculum development in vocational education and technical education: Planning, content, and implementation (p. 27), Boston: Allyn and Bacon.
A Leadership Curriculum for Youth

With no nationally accepted agricultural leadership curriculum available prior to LifeKnowledge, what materials were instructors using to teach leadership in agriscience programs? Although high school agricultural science instructors have the skills to develop their own curriculum materials, they prefer to use pre-existing materials (Wingenbach & Gartin, 2000), and the use of a quality curriculum provides a strong foundation for quality teaching to occur (Swan, 1996). Boccia (1997) points out “there is a meager base of programmatic guidelines for successful student leadership in schools” (p. 76). Though some teaching materials are available, it appears there is a need for a comprehensive leadership curriculum for youth.

Research has been conducted to determine the impact of intra-curricular activities on youth leadership development (Rutherford, Townsend, Briers, Cummins, & Conrad, 2002; Severs & Dormody, 1995; Townsend & Carter, 1983; Wingenbach, 1995) and the amount of leadership being taught in agricultural science classrooms (Morgan & Rudd, 2006). However, little research has been done to determine the curriculum materials used to teach leadership in high school agricultural science classrooms. Although many have speculated on the positive impact of the National FFA’s LifeKnowledge curriculum in the high school agricultural science classroom, to assess such impact one must first determine the leadership curriculum used prior to its adoption.

Purpose and Objectives

As Part One of a two-part study, the purpose of this study was to determine the types of curriculum being used by agricultural science instructors to teach leadership prior to the adoption of the LifeKnowledge curriculum. A follow-up study will then be conducted to determine current use of the LifeKnowledge curriculum and to measure trends in curriculum use pre- and post-LifeKnowledge. Specifically, the objectives of this study were to determine if:

1. Instructor-developed curriculum were being used for leadership instruction prior to the adoption of the LifeKnowledge curriculum;
2. Commercially available curriculum were being used for leadership instruction prior to the adoption of the LifeKnowledge curriculum; and if
3. Commercially available text books were being used for leadership instruction prior to the adoption of the LifeKnowledge curriculum.
4. Determine the intensity with which each resource incorporated leadership concepts.

Methods

This study was conducted using survey research and was part of a larger study. The National FFA Organization was utilized as the source of participant contact information. The population for this study was high school FFA chapter advisors at agricultural science programs during the time of data collection; the 2003-2004 school year. It is required that the FFA advisor be the agricultural education teacher, so this population could also be termed all high school agricultural education teachers during the 2003-2004 school year (FFA Constitution. art XI, § B). At the time of this study, there were 7,193 FFA chapters throughout the nation (National FFA Organization, 2002). To achieve a 95% confidence level with 5% sampling error, a sample size of 367 was needed (Dillman, 2000). To account for inactive programs, incorrect addresses, and other potential coverage error issues, a sample size of 400 was used. A list of FFA chapters was provided by the National FFA Organization for this study, and the sample was selected using simple random selection (Agresti & Finlay, 1997). FFA advisors in five states (Kansas, Maine, Nebraska, New Jersey, and Pennsylvania) where the LifeKnowledge curriculum had been pilot tested were not included in this sample to eliminate potential influence of the LifeKnowledge curriculum on...
the attempt to establish baseline data prior to *LifeKnowledge* becoming commonly used.

Participants were asked, “What leadership curriculum or text book are you currently using to teach leadership?” Responses to this question were sorted and grouped using the constant comparative method (Lincoln & Guba, 1985). Domain analysis was used to analyze all qualitative data following the strategies outlined by Spradley (1980). An expert panel of curriculum and leadership specialists with over 47 years of combined experience developing and evaluating agricultural education curricula grouped the leadership curriculum materials and related text books by common theme (domain). The expert panel then further categorized the types of leadership resources being used based on the intensity with which each resource incorporated leadership concepts. A scoring rubric was used which assessed intensity based upon number of leadership standards addressed from the National Agriculture, Food, and Natural Resources (AFNR) Career Cluster Content Standards (National Council for Agricultural Education, 2009), hours of instruction and activities, and level of lesson objectives according to Bloom’s Taxonomy (Bloom, Engelhart, Furst, Hill, & Krathwohl, 1956). Experts categorized each resource along a four-point scale: 1 (*unknown incorporation of leadership concepts*), 2 (*minimal/limited incorporation*), 3 (*moderate incorporation*), and 4 (*broad/thorough incorporation*). Copies of curriculum materials were procured for evaluation; materials from individual state curriculum offices were unable to be procured, therefore, for the purpose of this study, all state provided curricula were assumed to be governed by state standards which would include leadership concepts comparable to those in the AFNR Content Standards.

Data collection followed a modified version of the Tailored Design Method (Dillman, 2000) which employed bimodal data collection to reduce cost (Brashears, Akers, & Bullock, 2003). Participants were mailed a pre-notice letter notifying them that they had been selected to participate in this study, and instructions were provided within the letter explaining how they could access the survey instrument from the Internet. Four days later a paper instrument was mailed to the participants who had not already responded to the internet survey. A thank you/reminder postcard was mailed ten days later. A second survey instrument was mailed ten days following that to participants who had not yet responded. Eight days later phone calls were made to participants who had still not responded. An additional ten days were allowed for the collection of electronic and mailed responses. The final response rate was 41.8% (*n* = 167).

**Findings**

Of the 167 participants, 108 responded to the open-ended curriculum question, with 20 stating that no curriculum resources were used (“none”), 54 used only one curriculum resource, and 34 used two or more curriculum resources. Participant responses that included multiple curriculum resources were separated and each resource was listed in an appropriate domain/category. Table 1 summarizes the overarching domains and the frequency with which they appeared in the raw data.

The text *Leadership, Personal Development, and Career Success* from Cengage was the most popular resource. The second most popular material was curriculum provided through state curriculum offices (*n* = 25). Within this group, 11 participants used curriculum from the Instructional Materials Service (IMS) in Texas, four participants used materials from the Instructional Materials Lab (IML) in Missouri, two participants used materials from the Curriculum and Instructional Materials Center (CIMC) in Oklahoma, and eight participants stated they used materials from other states. Eighteen participants used the *Official FFA Manual* or *Official FFA Student Handbook* to teach leadership. In addition, 15 participants developed their own curriculum materials. These materials included “handouts,” “just notes,” “personal experience,” “articles,” “state FFA officer materials,” “Washington Leadership Conference materials,” and “various resources from college text books and Internet sources.”
Table 1
Leadership Curriculum Materials Used by Agricultural Science Instructors (n = 88)

<table>
<thead>
<tr>
<th>Curriculum Material Used (domain)</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td>Text: <em>Leadership, Personal Development, and Career Success</em></td>
<td>27</td>
</tr>
<tr>
<td>State provided curriculum</td>
<td>25</td>
</tr>
<tr>
<td><em>Official FFA Manual or Official FFA Student Handbook</em></td>
<td>18</td>
</tr>
<tr>
<td>Instructor developed materials</td>
<td>15</td>
</tr>
<tr>
<td>Parliamentary procedure materials</td>
<td>12</td>
</tr>
<tr>
<td>Agricultural science textbooks</td>
<td>9</td>
</tr>
<tr>
<td>Miscellaneous leadership books</td>
<td>9</td>
</tr>
<tr>
<td>Text: <em>Developing Leadership and Personal Skills</em></td>
<td>3</td>
</tr>
</tbody>
</table>

Note: Responses do not add up to 88 because some participants used more than one curriculum resource.

Parliamentary procedure materials were used by 12 participants as leadership curriculum. Nine participants used other agricultural science textbooks, with the most popular being *Agriscience: Fundamentals and Applications* by Cengage. A variety of miscellaneous books and materials were used by nine of the participants to teach leadership. These materials included Ziglar’s *I Can* curriculum, CEV multimedia videos, *Success in the World of Work* software, *Character First, How to Win Friends and Influence People*, *The 7 Habits of Highly Effective People*, *The Leadership Challenge*, and John Deere business curriculum. Three of the respondents stated they used the Pearson text *Developing Leadership and Personal Skills* to teach leadership.

Eleven participants stated that leadership was not taught in a specific course, but was taught throughout many courses within the agricultural science curriculum. Within this domain, responses included the following:

- “Indiana has 11 approved agricultural courses. Leadership is not one of them. It is taught throughout all 11 courses.”
- “Leadership is not formally taught from a text book. Rather, leadership, goal setting, and responsibility are taught as part of the science curriculum. Each student is given an agenda book in the beginning of the year. Lessons are given on goal setting, time management, and prioritizing, with assessment being part of the agenda book grade.”
- “We teach agriculture leadership everyday in our agriculture program. We were able to get 70% of our students to get involved in an after school activity to show their leadership. We just received a new book to use on leadership; however, I do not use a book at this time. I teach them from my own values.”
- “No text is used – other than the *Official FFA Manual*. Leadership skills and curriculum are included in, or should be included in, every course we teach!”
- “I teach leadership development in all my courses. We spend a couple of weeks intensely and then it is integrated throughout the year. I use several resources: My personal experience as a past state officer. I also use [Cengage’s] Leadership book, but I also refer to several resources I have acquired from different seminars I have attended.”
- “Integrated into a unit within each course taught; *FFA Student Handbook*, parliamentary procedure workbook; and *Bits and Pieces*.”
- “I currently do some leadership activities with my 7th and 8th graders in their FFA unit - I do a leadership and
conflict resolution unit with my freshman – Also, talk about leadership with my seniors in advanced ag and with all agribusiness/entrepreneurship class members.”

The expert panel of curriculum and leadership specialists further categorized participant responses based on the intensity with which each curriculum resource incorporated leadership concepts recommended by National Agriculture, Food, and Natural Resources Career Cluster Content Standards (National Council for Agricultural Education, 2009). Modal responses from the panel of experts are presented, using the previously identified curriculum resource domains, in Table 2.

A comparison of Tables 1 and 2 reveals that two of the five most often used curriculum materials by agricultural science instructors to teach leadership prior to the adoption of the LifeKnowledge curriculum had minimal/limited incorporation of leadership concepts. Half of the curriculum materials being used to teach leadership prior to LifeKnowledge had broad/thorough incorporation of leadership theory and principles. The researchers were able to review copies of leadership texts mentioned and also state provided curricula from multiple states represented in the study. These state curricula were found to be based upon state standards which included personal leadership development in each case. Instructor developed materials could not be evaluated and, although they may be of excellent quality due to the curriculum training most teachers receive during pre-service activities, were classified as unknown because the level of leadership concepts could not be determined. In addition, it is unknown how each agricultural science instructor interpreted the term leadership or if their interpretation was accurate.

<table>
<thead>
<tr>
<th>Curriculum Material Used (domain)</th>
<th>Level of Incorporation of Leadership Concepts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Text: <em>Leadership, Personal Development, and Career Success</em></td>
<td>X</td>
</tr>
<tr>
<td>State provided curriculum</td>
<td>X</td>
</tr>
<tr>
<td><em>Official FFA Manual or Official FFA Student Handbook</em></td>
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</tr>
<tr>
<td>Instructor developed</td>
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<td>X</td>
</tr>
<tr>
<td>Miscellaneous leadership books</td>
<td>X</td>
</tr>
<tr>
<td>Text: <em>Developing Leadership and Personal Skills</em></td>
<td>X</td>
</tr>
</tbody>
</table>
Conclusions / Recommendations / Implications

It is apparent from this study that a wide variety of materials were being used to teach leadership in agricultural science classrooms prior to the adoption of the LifeKnowledge curriculum. While the textbook Leadership, Personal Development, and Career Success was the most popular material being used by respondents in this study, there was not a curriculum material or text being used by the majority of instructors. Similarly, state curriculums were popular, but were also not used by a majority of instructors.

Participants exhibited a variety of practices when incorporating leadership curriculum into their agriscience programs. Some instructors focused on the Official FFA Manual as their source for leadership knowledge, while others focused on parliamentary procedure manuals. Still others used materials available from popular sources, and some instructors relied on personal experiences for teaching leadership. While each of these curriculum materials has their strengths, it is evident that there was a lack of consistency in what leadership knowledge base was being used for leadership instruction prior to LifeKnowledge. With the variety and variability of options being used, the amount of exposure to leadership education within an agriscience classroom is difficult to gauge. Some instructors view leadership through the lens of Kouzes and Posner’s The Leadership Challenge, which is widely used and rooted in leadership research (Kouzes & Posner, 2007), while others view it through the lens of a general agriscience textbook, which may contain only an overview of FFA and a few pages on interpersonal skills.

This study revealed two primary observations. First, there is a need for a common definition of leadership that all agricultural science instructors can share. Just as agricultural science instructors have a common definition for animal science or horticulture, there should be an accepted definition for leadership. Second, there is a need for appropriate curriculum that all agricultural science instructors can access to use as a foundation for leadership instruction. Simonsen and Birkenholz (2008) also recommended that core leadership content topics be identified and taught nationally in secondary agricultural education programs. Since the time this study was conducted, the National FFA Organization has helped to address both of these observations with the LifeKnowledge curriculum. A “standardized” definition of leadership and nationally accepted leadership curriculum would not only add to the process component of the Finch and Crunkilton (1999) model, but would aid in the evaluation of student leadership knowledge nationally.

A follow-up study should be conducted to determine current use of the LifeKnowledge curriculum and to measure trends in curriculum use pre- and post-LifeKnowledge. The results of this study should be helpful in determining the impact of the LifeKnowledge curriculum now that baseline data prior to its release are available. Research should be conducted to determine how agricultural science instructors define leadership and whether the LifeKnowledge curriculum has replaced curriculum materials found in this study, been added to materials already in use, or not been adopted. In addition, research should determine if development of LifeKnowledge has resulted in more leadership education incorporated into agriscience classes, more stand-alone leadership courses offered, or had no effect on the amount of leadership education included in agriscience programs. Perceptions of students, teachers, and administrators should be assessed to determine if changes have occurred in the perception of agricultural education as a source of leadership development.
References


A. CHRISTIAN MORGAN is an Assistant Professor in the Department of Agricultural Leadership, Education, and Communication at the University of Georgia, 130 Four Towers, Athens, GA 30602, acm@uga.edu.

NICHOLAS E. FUHRMAN is an Assistant Professor and Extension Specialist in the Department of Agricultural Leadership, Education, and Communication at the University of Georgia, 139 Four Towers, Athens, GA 30602, fuhrman@uga.edu.

DIANA L. KING is an Assistant Professor in the Department of Agricultural Leadership, Education, and Communication at the University of Georgia, 2360 Rainwater Rd., Tifton, GA 31793, dlking@uga.edu.

FRANK B. FLANDERS is an Assistant Professor in the Department of Agricultural Leadership, Education, and Communication at the University of Georgia, 132 Four Towers, Athens, GA 30602, flanders@uga.edu.

RICK D. RUDD is a Professor and Head of the Department of Agricultural and Extension Education at Virginia Tech University, 2270 Litton Reaves Hall, Blacksburg, VA 24061, rrudd@vt.edu.
How Are We Educating Agricultural Students? A National Profile of Leadership Capacities and Involvement in College Compared To Non-Agricultural Peers

David M. Rosch  
*University of Illinois at Urbana-Champaign*  
Natalie Coers  
*University of Florida*

Given the importance of leadership development within the various agricultural professions, a national sample (n=461) of students with agriculture-related majors from 55 colleges was compared to a similarly-sized random peer group from the same institutions. The data were analyzed to compare the agricultural student sample to their peers with respect to a variety of social identities (e.g. race, gender, political leanings); high school and college involvement and leadership positions held within co-curricular activities and organizations; and scores from several measures of leadership-related outcomes. These outcomes included socially responsible leadership practices, leadership efficacy, social change behaviors, cognitive complexity, and the degree to which students participate in socio-cultural discussions. Findings suggest that while agricultural students display similar levels of involvement and leadership in high school and higher levels in college, they do not make some of the same leadership outcome gains in college as the comparison population. These findings hold important implications for the way agricultural educators structure classroom environments and how they advise student organizations.

Keywords: college students, student leadership skills, student involvement

Institutions of higher education have exhibited a strong commitment to leadership development since their inception, preparing professional and societal leaders for many years (Astin & Astin, 2000). Marcketti and Kadolph (2010) stressed, “The importance of leadership education for today’s undergraduate students cannot be underestimated” (p.131). As both future educators of agricultural students and contributors to the agricultural industry as a whole, colleges of agriculture play an important role in preparing students to take on these roles. Schumacher and Swan (1993) recommended the further development of leadership programs for colleges of agriculture, as “students indicated both a strong need and willingness to participate in leadership development programs” (p. 8). A recent study showed that over 1,000 higher educational institutions currently offer leadership development programs of some form (Riggio, Ciulla, & Sorensen, 2003). Part of this increase is attributed to a shifting definition of leadership from a hierarchical, narrow conception to more strongly underscore the importance of developing relationships (Komives, Lucas, & McMahon, 2007) while acting ethically and congruent with one’s personal values (Kouzes & Posner, 2010). These skills are what many describe as necessary for success in contemporary organizations (Friedman, 2007; Seidman, 2007). Leadership and other transferable skills are developed through various means, including training, personal experience, observation and reflection, and education (Brungardt, 1996; Marcketti & Kadolph, 2010; The National Academies, 2009).

Regardless of the continuing shift in definition, “leadership skills” is a general trait
desired by employers seeking job candidates (National Association of Colleges and Employers, 2011; Astin & Astin, 2000). Moreover, the training of a “scientific and professional workforce that addresses the challenges of the 21st century (Doerfort, 2011, p. 9) is one of the six key research priorities of the American Association of Agricultural Educators (AAAE). Powell and Agnew (2007), writing for agricultural educators, emphasized, “leadership is a valued attribute for employers and for society in general, one which is expected of university students upon graduation” (p. 11). Birkenholz and Schumacher (1994) reported a strong need for future agricultural leaders, where educators must develop and implement strategies that develop the future of the field. Ewing, Bruce, and Ricketts (2009) noted the collegiate environment as ideal for leadership development with ample opportunities such as student service programs, collegiate student organizations, and service learning projects. To meet this expectation of leadership attributes, students must be engaged in the numerous opportunities available during their collegiate experience.

Students who participate in co-curricular opportunities available on campus have a clear advantage over students who choose not to engage in these means of leadership development (Astin, 1999; Foubert & Grainger, 2006; Kuh, 1995); Freeman and Goldin, 2008). Additionally, Ewing, Bruce, and Ricketts (2009) noted, “leadership skill and ability may be perceived as higher for members of collegiate organizations when compared with non-members” (p.120). Despite its perceived benefits, student engagement and involvement in leadership development through coursework, programming, and student organizations can be a challenge at colleges and universities. Powell and Agnew (2007) emphasized, “Since student participation in these organizations is usually not required, faculty and organizational advisors often struggle with how to increase student participation in leadership development activities through these organizations” (p. 11). Discovering why some students choose not to participate in such beneficial experiences is an area in need of further exploration (Ewing, Bruce, & Ricketts, 2009). Although Shertzer and Schuh (2004) found that, “student leaders generally will emerge without needing to be pushed and can be trusted to serve in their roles without much supervision because of their leadership experience” (p.127), additional opportunities would continue to deepen the leadership capacity of these students. Connors, Velez, and Swan (2006) observed there may be a gap in student awareness of leadership development opportunities on campus (formal and informal). Investing in student leadership development at all levels of experience and involvement can positively impact both the current and future roles of these young leaders.

Although collegiate student leadership development tends to be a focus for career preparation, it has been well established that leadership development begins prior to college enrollment (Park & Dyer, 2005; Allen, Ricketts, & Priest, 2007). Several researchers have suggested the positive impact of high school or agricultural organization involvement (FFA, 4-H, etc.) on leadership development and preparation in students (Allen, Ricketts, & Priest, 2007). Based on Ajzen’s (1991) Theory of Planned Behavior, Allen, Ricketts, and Priest (2007) inferred “one could predict that students who serve as officers in high school organizations (intention) develop self-efficacy about leadership (perceived behavioral achievement) and will serve as officers and/or in other leadership roles in collegiate and professional organizations (behavioral achievement)” (p. 57). Allen, Ricketts, and Priest (2007) challenged educators to continue asking, “Does the pre-college leadership education experience have any effect on a college student’s involvement in leadership roles while enrolled in college or after graduation?” (p. 56). Transitions in maturity and leadership experience occur from high school involvement to leadership opportunities in collegiate organizations. Connors, Velez, and Swan (2006) stressed that “it is critically important that faculty, advisors, researchers, and administrators in land-grant university colleges of agriculture pay close attention to the leadership development of the undergraduates in their institutions” (p. 95).
Leadership Education in Agricultural Education

Agricultural students, in particular, are no exception to the increasing need for prepared graduates with the skills necessary to lead in their respective communities and careers. Leadership has been associated with agricultural and extension education for decades (Connors & Swan, 2006). The AAAE has joined the call for graduates prepared for positions of influence in their communities, adding 21st Century workforce preparation, the influence of social structures within agricultural education programs, and the creation of engaged, vibrant communities to its current national research priorities (Doerfort, 2011). Based upon the National Standards for Teacher Education in Agriculture adopted by the American Association for Agricultural Education (AAAE), education programs are to develop the skills and knowledge for all content areas teachers may be expected to teach, including the content area of leadership (Simonsen & Burkenholz, 2010). Connors, Velez, and Swan (2006) stressed that “agricultural businesses, commodity organizations, non-profit groups, and government agencies need competent leaders who will provide direction and vision for the future of the agricultural industry (p. 94). The National Academies’ 2009 Transforming Agricultural Education for a Changing World Report in Brief highlighted, “This agricultural workforce must constantly respond to changes in the physical, economic, and social environment surrounding agriculture” (p.1), and that “academic institutions with programs in agriculture are in a perfect position to foster the next generation of leaders and professionals needed to address these challenges” (p.1). Course development within colleges of agriculture reflects the realization of leadership as an important skill for undergraduate students (Park & Dyer, 2005). Allen, Ricketts, and Priest (2007) noted, “There is a need for strong leaders in the agricultural industry, and organizations are looking for college of agriculture graduates who demonstrate strong leadership abilities” (p. 56). Therefore, colleges of agriculture should “position themselves at the cutting-edge and offer students the opportunity to learn about the complexities of agriculture, grapple with its emerging challenges, and find their opportunity to contribute as leaders and participants” (The National Academies, 2009, p. 1). Considerable ground has been made in colleges of agriculture to develop leadership courses and programs; however, continued assessment and development of courses must occur to maintain content reflective of prior student experiences and industry needs for graduates (Park & Dyer, 2005; Engbers, 2006; Ewing, Bruce, & Ricketts, 2009; Dugan & Komives, 2007).This transformation and adaptation will take time, but it must begin now in order to reflect the needs of the agricultural industry and engage students entering colleges of agriculture from the first day they step on campuses.

Theoretical Framework

The theoretical frame employed within this study is founded upon Astin’s Input-Environment-Output (I-E-O) model of student learning (Astin, 1993), in which students enter the college environment with certain personal characteristics and past experiences. While there, they interact with the college environment, and the combination of inputs and the environments lead to certain outcomes. This frame was designed to measure the varying effects of involvement and positional leadership within student organizations, as well as participation in structured leadership trainings, on leadership-related outcomes while adjusting for personal differences and pre-college experiences in students. Within this study, a framework of leadership was used that is described as “a purposeful, collaborative, values-based process that results in positive social change” (Komives & Wagner, 2009, p. xii) and serves as the definition of leadership within the Social Change Model of Leadership Development (Higher Education Research Institute, 1996), an increasingly popular model of leadership taught on college campuses. This style of leadership has been described as “post-industrial” in nature (Faris & Outcalt, 2001; Kezar, Carducci, & Contreras-McGavin, 2006; Rost, 1993) in that its less hierarchical nature emphasizes personal self-knowledge and values, collaboration and social skills, and positive
social change. This can be contrasted with what has been described as “industrial” leadership, in which control, uniformity, and supervision is stressed (Faris & Outcalt, 2001).

The Social Change Model (SCM) posits that emerging college student leaders should demonstrate capacity to lead in three separate areas: an individual domain, in which they are conscious of their values and personal attributes, and exercise these attributes consciously; a group domain, in which they collaborate gracefully with others and help their groups reach common purpose; and community domain, in which they lead to create positive social change (Astin, 1996; Higher Education Research Institute, 1996). The SCM served as the model of leadership utilized within this study.

**Methods**

**Population**

This study used data collected in the spring of 2009 as part of the Multi-Institutional Study of Leadership, which included a total of 55 colleges and universities that were selected from a sample of over 150 that had responded to a call for participation (Dugan & Komives, 2010) and were included due to their diversity in Carnegie classifications, selectivity, geography, size, control, and populations of students served. From these institutions, 155,716 students were invited to participate, and 56,854 completed surveys, for a 37% response rate (Dugan & Komives, 2010).

**Data Collection and Sample**

All data collection was conducted during the spring 2009 semester through emails sent with links to the online survey. Simple random samples of students were invited at institutions with undergraduate enrollments greater than 4,000. For smaller institutions, their entire undergraduate population was invited. Students received an email invitation and up to three reminders.

An item on the MSL invited students to identify their “primary major” from a list of 21 options, of which an option was “Agriculture.” A total of 461 students (0.5%) selected this option – this collection of students served as the sample of interest within this study. A total of 262 (57%) identified as female, 401 (87%) as Caucasian/White, 7 (2%) as African-American/Black, 14 (3%) as Asian-American or with Asian descent, 13 (3%) as Latino/Hispanic, while 26 (5%) either identified as multi-racial or did not identify. A comparison sample should optimally be of similar size and variability to the sample of interest within this study. A total of 262 (57%) identified as female, 401 (87%) as Caucasian/White, 7 (2%) as African-American/Black, 14 (3%) as Asian-American or with Asian descent, 13 (3%) as Latino/Hispanic, while 26 (5%) either identified as multi-racial or did not identify. A comparison sample should optimally be of similar size and variability to the sample of interest (Miles & Shevlin, 2004), so rather than compare the Agriculture students to the remainder of the national sample of non-Agriculture students, a simple random sample (n=461) was selected from within this group to meet the requirement of homogeneity of variance in outcome variables across both samples. Within the comparison sample, 299 (65%) identified as female, while 341 (74%)
identified as Caucasian/White, 26 (5%) as African-American/Black, 35 (8%) as Asian-American/Asian, and 19 (4%) as Latino/Hispanic, while 40 (8%) identified as multi-racial or did not identify. The gender and racial demographics for the comparison group were not statistically different from the overall profile of the national sample.

Instrumentation and Variables

The MSL was designed to reflect Astin’s (1993, 1999) I–E–O model. Therefore, students were invited to respond to items regarding their personal and pre-college characteristics (Inputs), as well as their current involvements while in college (Environment). Outcomes were measured using a number of scales associated with leadership development.

Input and Environmental Variables

Students were asked to report their gender, race, and political orientation (a five-point scale from “very liberal” to “very conservative”). Demographic information regarding gender and race for the two samples were described earlier in the previous section. With regard to political orientation, 35% of the group of Agriculture students reported themselves as “conservative” and 11% as “very conservative,” compared to 17% and 5%, respectively, within the peer group. Approximately 16% identified as “liberal” and 6% as “very liberal” compared to 32% and 10%, respectively, within the peer group. Approximately 32% of the agriculture students reported themselves as “moderate” compared to 36% of their comparison peers.

Students were also asked to report their remembered level of involvement in and leadership of student groups in high school (“HS Involvement” and “HS Leadership,” respectively). HS Involvement was measured by a scale with a range of 4 – 16, incorporating four items focusing on governance organizations, spirit groups, performing arts organizations, and academic clubs, respectively. Students were then asked to rate their remembered leadership capacities while in high school, using a condensed version of the Socially Responsible Leadership Scale (“SRLS Pre-test”), which will be described later. Using a “recollection proxy pre-test design,” where students evaluate their remembered competencies from periods in their past, is not necessarily a valid measure of competency at the time students were asked to recall. However, it can serve as a valid means of measuring students’ perceived growth in the area of interest, especially when students are asked to rate their current competencies using the same measure (Trochim, 2006). The SRLS Pre-test included nine items, with scores ranging from 1 -5. In addition, students were asked to report the current extent of their involvement in and leadership of student organizations in college. Lastly, students were invited to share the extent of their participation in leadership development training programs while in college (“COL Lead Training”), including both curricular (e.g. a leadership class) and co-curricular (e.g. a retreat or conference). Involvement and leadership in high school and college organizations were measured on four-point scales ranging from “never” to “very often,” while participation in leadership trainings was measured on a five-point scale ranging from “never” to “much of the time.”

Outcome Variables

The Socially Responsible Leadership Scale (SRLS) was utilized as the outcome variable measuring leadership capacity within the theoretical frame of the SCM. It has been shown to possess acceptable levels of reliability and validity (Dugan & Komives, 2007; Dugan & Komives, 2010; Slack, 2006). Also included was a scale of Leadership Self-Efficacy (LSE), designed using Bandura’s model of self-efficacy (Bandura, 1997) to measure one’s confidence in leading others. Scales measuring indirect leadership capacity contained within the MSL included measures of Cognitive Complexity (“CC,” measuring the degree that students report growth in critical thinking skills), Social Change Behaviors (“SCB,” measuring the degree to which students engage in community-minded change actions), and Socio-Cultural Discussions (“SCD,” measuring the degree to which students engage in discussion with peers around topics of personal and societal differences). Each of these
scales were borrowed from the long-standing National Survey of Living Learning Programs (Inkelas, 2004; Inkelas, Vogt, Longerbeam, Owen, & Johnson, 2006). A sample item from the Cognitive Complexity scale is, “To what extent have you grown while in college in your ability to critically analyze ideas and information?” A sample item from the Social Change Behaviors scale is, “How often have you been actively involved with an organization that addresses a social or environmental problem?” A sample item from the Socio-Cultural Discussions scale is, “How often have you discussed major social issues such as peace, human rights, and justice?” All scale items other than the LSE ranged from 1 to 5, while the LSE ranged from 1 to 4. A summary of significant variables in this study can be found in Table 1.

Table 1

<table>
<thead>
<tr>
<th>Input Variables</th>
<th>Environmental Variables</th>
<th>Outcome Variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>COL Involvement</td>
<td>Leadership capacity (SRLS)</td>
</tr>
<tr>
<td>Race</td>
<td>COL Leadership</td>
<td>Leadership Self-Efficacy (LSE)</td>
</tr>
<tr>
<td>Political orientation</td>
<td>COL Lead Training</td>
<td>Cognitive Complexity (CC)</td>
</tr>
<tr>
<td>HS Involvement</td>
<td></td>
<td>Social Change Behaviors (SCB)</td>
</tr>
<tr>
<td>HS Leadership</td>
<td></td>
<td>Socio-cultural Discussions (SCD)</td>
</tr>
<tr>
<td>SRLS Pre-test</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Data Analysis**

This research was designed to investigate differences between students who report “Agriculture” as their primary major and those that do not. To compare the personal demographic data for the Agriculture students with the comparison sample, chi-square analyses were conducted for each variable. To determine the size of effect for each finding of statistical significance, Cramer’s phi was calculated (Ellis, 2010). To examine potential differences between the two groups with respect to the chosen environmental and outcome variables, T-tests were conducted, while Cohen’s d (Hinkle, Wiersma, & Jurs, 2002) was calculated to determine the effect size of significant findings.

**Results**

Means and standard deviations for each scale variable were examined, and are included in Table 2. In general, Agriculture students’ scores were higher on measures of involvement compared to the random sample, and were lower on outcome measures of leadership capacity and related competencies.
Table 2
Means and Standard Deviations for Scaled Input, Environmental, and Outcome Variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Agriculture Students (n=461)</th>
<th>Comparison Group (n=461)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>μ</td>
<td>SD</td>
</tr>
<tr>
<td>INPUTS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HS involvement</td>
<td>11.54</td>
<td>3.61</td>
</tr>
<tr>
<td>HS leadership</td>
<td>2.85</td>
<td>1.22</td>
</tr>
<tr>
<td>SRLS Pre-test</td>
<td>3.87</td>
<td>0.55</td>
</tr>
<tr>
<td>ENVIRONMENT</td>
<td></td>
<td></td>
</tr>
<tr>
<td>COL Involvement</td>
<td>3.41</td>
<td>1.41</td>
</tr>
<tr>
<td>COL Leadership</td>
<td>2.27</td>
<td>1.51</td>
</tr>
<tr>
<td>COL Lead Training</td>
<td>1.64</td>
<td>0.48</td>
</tr>
<tr>
<td>OUTCOMES</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SRLS</td>
<td>3.87</td>
<td>0.52</td>
</tr>
<tr>
<td>LSE</td>
<td>3.05</td>
<td>0.67</td>
</tr>
<tr>
<td>CC</td>
<td>2.98</td>
<td>0.52</td>
</tr>
<tr>
<td>SCB</td>
<td>2.45</td>
<td>0.70</td>
</tr>
<tr>
<td>SCD</td>
<td>2.81</td>
<td>0.81</td>
</tr>
</tbody>
</table>

To determine if statistically significant differences existed between the two samples with regard to gender, race, and political orientation, a chi-square analysis was conducted for each variable. Cramer’s phi was calculated to determine the effect size of any significant differences (p < .05). A significant difference with a small effect was found with regard to gender ($\chi^2 (2, N=922) = 7.85, p = .02, \phi = .09$). Significant differences with moderate effects were found for race ($\chi^2 (25, N=922) = 48.91, p = .003, \phi = .23$), and political orientation ($\chi^2 (4, N = 920) = 71.20, p < .0001, \phi = .28$). An interpretation of these results is that the sample of Agriculture students contained more male students, more Caucasian students, and more students who identified as “conservative” or “very conservative” than the random sample of college students used as a comparison. No significant differences were found with respect to SRLS Pre-test score, $t(920) = 0.83, p = .40$.

The degree to which students reported being involved in and leaders of high school organizations was analyzed using T-tests. Students across the two samples did not differ in the degree to which they were involved in high school student organizations, $t(920) = -.4, p = .67$; nor in the degree to which they reported occupying positions of leadership within these organizations, $t(920) = -1.20, p = .23$.

The Environmental variables examined in this study were students’ reported involvement in and leadership of student organization, as well as the extent to which they participated in leadership training programs. T-tests were calculated, while Cohen’s d was examined if significant differences were found (p < .05). Agriculture students reported being more involved in college organizations than their non-Agriculture peers, $t(919) = -2.94, p = .003$; with a small effect size (d = .11). Moreover, they held leadership positions within these organizations to a greater extent, $t(920) = 2.76, p = .006$, with a small effect size (d = .09). However, agriculture students participated in leadership training events at marginally the same rate as their peers, $t(920) = -1.82, p = .07$.

Outcome variables for this study were leadership capacity measured through SRLS score, leadership self-efficacy (LSE score), and scores from measures of cognitive complexity, social change behaviors, and socio-cultural discussion participation. T-tests were conducted, while Cohen’s d was calculated if significant differences were found. Agriculture students’ SRLS scores of leadership capacity were lower, $t(920) = 3.07, p = .002$; with a small-to-moderate effect size (d = 19). Agriculture students did not differ from the comparison sample with regard to LSE score, $t(920) = 0.89$, 0.15.
p = .23; nor did they differ on a measure of social change behaviors, t(918) = 1.07, p = .28. However, significant differences were found in measures of cognitive complexity, t(920) = 2.89, p = .004; and socio-cultural discussions, t(920) = 4.57, p < .0001. Small-to-moderate effect sizes were observed with regard to cognitive complexity (d = .18) while moderate effects were seen in socio-cultural discussion scores (d = 0.29). A summary of findings can be found in Table 3.

Table 3
Summary of findings: A Comparison of Agricultural Students with Comparison Group

<table>
<thead>
<tr>
<th>Variable</th>
<th>p Value</th>
<th>Effect Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>.02</td>
<td>.09</td>
</tr>
<tr>
<td>Race</td>
<td>.003</td>
<td>.23</td>
</tr>
<tr>
<td>Political orientation</td>
<td>&lt;.0001</td>
<td>.28</td>
</tr>
<tr>
<td>High school involvement</td>
<td>.67</td>
<td></td>
</tr>
<tr>
<td>High school leadership</td>
<td>.23</td>
<td></td>
</tr>
<tr>
<td>College involvement</td>
<td>.003</td>
<td>.11</td>
</tr>
<tr>
<td>College leadership</td>
<td>.006</td>
<td>.09</td>
</tr>
<tr>
<td>College leadership training</td>
<td>.07</td>
<td></td>
</tr>
<tr>
<td>SRLS pre-test</td>
<td>.40</td>
<td></td>
</tr>
<tr>
<td>SRLS score</td>
<td>.002</td>
<td>.19</td>
</tr>
<tr>
<td>LSE score</td>
<td>.23</td>
<td></td>
</tr>
<tr>
<td>Cognitive complexity</td>
<td>.004</td>
<td>.18</td>
</tr>
<tr>
<td>Social change behaviors</td>
<td>.28</td>
<td></td>
</tr>
<tr>
<td>Socio-cultural discussions</td>
<td>&lt;.0001</td>
<td>.29</td>
</tr>
</tbody>
</table>

Note: significant differences (p < .05) in bold

Discussion

The results revealed that the group of students who reported “Agriculture” as their primary major included slightly more males, was moderately less racially diverse, and reported as moderately more politically conservative than a comparison group of students from the same institutions. Agriculture students and their comparison peers were involved in and led student organizations to similar degrees while in high school. While in college, agriculture students reported slightly higher degrees of involvement with college organizations, and held slightly more leadership positions within them, than the comparison group. However, they did not participate in leadership training events on campus to a greater degree. Perhaps most noteworthy for a study of student leadership outcomes, agriculture students displayed moderately lower levels of leadership capacities in college – while not significantly differing on a “recollection pre-test” of the same capacities in high school. In addition, agriculture students scored moderately lower on a measure of cognitive complexity and engaged moderately less in socio-cultural discussions with peers when compared to the randomized group of students. The largest differences, measured by effect size, between the two groups were students’ political orientation and the degree of engagement in socio-cultural discussions with peers. No differences were found between the groups on measures of leadership self-efficacy and the degree to which students engaged in social-change behaviors such as political activism or community organizing.

Several studies in the past have shown the positive effects of involvement in student organizations on a variety of outcomes, including leadership development (Astin, 1999; Foubert & Grainger, 2006; Kuh, 1995). These findings suggest that involvement in these organizations may be more nuanced than originally considered, given that agriculture students displayed higher degrees of involvement and less leadership capacity.

Recent prior studies of student leadership capacity have shown that the degree to which
students engage in socio-cultural discussions with peers – that is, how often they discuss issues of personal and social importance or issues in which they differ from others – is an important predictor of the types of post-industrial leadership capacities relevant for professional success in the Twenty-first Century (Dugan & Komives, 2007, 2010). The results of this study show that students primarily situated within the field of agriculture engaged in these discussions less often than their peers, and that the extent of the gap may be potentially large. In addition, agriculture students displayed a small-to-moderate difference in scoring lower on a test of self-perceived cognitive complexity – that is, the degree to which they reported feeling effective in connecting divergent information and engaging in areas in which they knew little but would like to learn more.

Implications

These findings suggest that the act of engaging with peers in an organization, when controlling for other personal and environmental factors, may not be as significant a predictor of leadership development as previously thought. The degree to which students authentically engage with their peers and connect with them around discussions of personal significance may serve as the significant predictor when studying factors within student involvement that lead to increased leadership capacity. As the results are based on a nationally representative sample of students, the findings in this study have important implications for agricultural classroom instructors and advisors of individual students and agriculture-based student organizations.

Those who serve as course instructors might increase both student cognitive complexity and leadership capacity by incorporating important social issues into their classrooms and curriculum, while allowing, expecting, and encouraging dissenting viewpoints from students who engage in the discussion. While these findings suggest that agriculture students may be more homogenous than a random sample, this does not imply strict homogeneity. For example, 22% of agriculture students self-report as “liberal” or “very liberal.” Allowing for differing perspectives and dissenting viewpoints may yield critical discussion that builds cognitive growth and leadership development opportunities in agriculture-oriented classrooms.

In the same way, advisors to students might provide more encouragement or opportunity for deep and meaningful dialogue amongst peers. Both authors have served in advisory roles to student organizations in the past, and know the pressure that students may feel at times to “get through the agenda.” Such meetings may provide a satisfactory level of task productivity yet not build the type of social atmosphere necessary for authentic engagement in a peer setting (Levi, 2011). Moreover, it may leave students without the opportunity to practice the skills they will need to collaborate with or supervise diverse others in less-structured environments.

Suggestions for Future Research

While recent studies have shown the correlation between socio-cultural discussion and leadership capacity (Dugan & Komives, 2007; Dugan & Komives, 2010), more research must be conducted to examine the relationship between these two constructs, especially in an agriculture-oriented context like Collegiate FFA organizations. For example, how might the participation in socio-cultural discussions lead a student to report higher levels of leadership capacity while not resulting in an increased score for leadership self-efficacy? In what ways does participation in these discussions lead to the ability to collaborate more effectively, or possess a greater capacity to lead a group within the context of a larger organization? Anecdotal evidence may exist, but so far little research has been conducted examining this relationship. In addition, the second-largest difference between the two groups was found in political orientation. More research could be conducted examining the potential mediating or moderating role that political orientation may play in engaging in socio-cultural discussions. Again, anecdotal evidence may exist, but no rigorous research has been conducting examining the two constructs.

Another line of potential research regards the study of agriculturally-based student
organizations. Many of these organizations are some of the oldest organizations on the college campus and exist on the high school level as well. They have been studied extensively in the past with regard to their effect on student leadership development (Anderson, Bruce, & Mouton, 2012; Ball, Garton, & Dyer, 2001; Connors & Swan, 2006; Hastings, Barrett, Barbuto, & Bell, 2011; Park & Dyer, 2010). However, surprisingly little research has been conducted with regard to students’ experiences in collegiate agricultural organizations (i.e. CFFA, 4-H, PAS, etc.) or the discipline-based organizations popular in many colleges of agriculture. What themes exist regarding their organizational structures, especially as they may differ from other non-agricultural organizations? How do students interact, set strategic priorities, accomplish goals, and select peers for leadership positions within them, especially compared to other student organizations not affiliated with the field of agriculture?

Another potential direction for research is the degree to which socio-cultural discussion matters to the development of students relates to the internationalization of the agricultural curriculum. Internationalization has been a strong area of emphasis in the past in agricultural education and continues to be a priority area for colleges of agriculture across the nation. The National Strategic Plan and Action Agenda for Agricultural Education outlines a vision where, “all people value and understand the vital role of agriculture, food, fiber and natural resources systems in advancing personal and global well-being,” with the mission of agricultural education reflecting the preparation of students for that vision (National Council for Agricultural Education, 2000, p. 3). The National Academies (2009) includes this area among their steps for enabling education programs to meet industry expectations, recommending “institutions should increase students’ exposure to international perspectives by supporting targeted learning-abroad programs and by incorporating international perspectives into existing courses” (p.2). Additional research is needed to determine if such experiences and cultural awareness at secondary and post-secondary levels may enhance the leadership capacity of agricultural students to engage in socio-cultural discussions.

Finally, the use of mutually beneficial community organization partnerships should be explored for various colleges of agriculture courses. Strategic partnerships offer students professional experience while making a stronger connection point for community organizations and corporations to communicate needs and expectations for future employees (The National Academies, 2009). Such relationships could offer students the opportunity develop deeper levels of cognitive complexity by promoting agricultural awareness while engaging in rich, socio-cultural experiences with reflection and discussion elements incorporated into the course work.

Conclusion

This study highlighted that agricultural students maintain a strong level of involvement in leadership development throughout their high school and collegiate experience; however, such involvement may not necessarily lead to growth in leadership capacity in comparison to non-agricultural students. These findings may be related to deficits seen in agriculture students’ self-reported cognitive capacity and participation in socio-cultural discussions. Our results of this study imply that agricultural educators may benefit their students in providing and designing opportunities for leadership development that include experiences with socio-cultural contexts and reflection. This is reflective of Freeman and Goldin’s (2008) findings that leadership programs with intentional design offer students practical experiences to better their leadership capacities for current and future application.

It is clear that change is needed in higher education programs to reflect the expectations of the agricultural industry and growing interdisciplinary collaborations in our global society. The National Academies (2009) emphasizes, “If institutions of higher learning do not address the changes needed, they risk becoming irrelevant. Without significant action, graduates of these programs will have difficulty keeping up with the changing needs of society and building stable careers, and the nation will
miss its opportunity for leadership in addressing the global challenges related to food and agriculture” (p. 2). Although involvement in leadership development at the secondary level may indicate active student involvement in collegiate organizations and in future professional opportunities (Allen, Ricketts, & Priest, 2007), further emphasis is needed in leadership development within agricultural classrooms for the agricultural industry to have sustainable leadership for years to come.

References


DAVID M. ROSCH is an Assistant Professor of Leadership Studies in the Agricultural Education Program at the University of Illinois at Urbana-Champaign, 137 Bevier Hall, Urbana, IL 61801, dmrosch@illinois.edu.

NATALIE COERS is a Program Coordinator for the College of Agricultural and Life Sciences Teaching Resource Center and Leadership Institute at the University of Florida, 2002 McCarty Hall D, Gainesville, FL 32611, ncoers@ufl.edu.
Teacher Behaviors Contributing to Student Content Engagement: A Socially Constructed Consensus of Undergraduate Students in a College of Agriculture

Christopher M. Estepp
Sul Ross State University
T. Grady Roberts
University of Florida

Students in colleges of agriculture will face a dynamically changing workplace. In order to learn the skills needed to succeed in such an environment, students must be cognitively engaged in the college classroom. Engagement with instructional content is a precursor to learning, and teachers in colleges of agriculture must shift towards using more learner-centered, engaging instructional methods. The purpose of this qualitative study was to explore college of agriculture students’ perspectives of specific teacher behaviors contributing to cognitive engagement. A focus group methodology was applied using the Student Content Engagement (SCE) framework to guide the interviews. The SCE framework consists of four constructs that must be in place for cognitive engagement to occur: subject matter content level, occasion for processing, physiological readiness, and motivation. Results of the study showed a multitude of teacher variables contributed to student content engagement and many of the findings were consistent with prior research about effective teaching. What is more, teacher immediacy was discovered as a consistent theme throughout all of the constructs. We concluded that teacher immediacy might be a construct for consideration in the SCE framework.

Keywords: agricultural education; college of agriculture; student engagement; teacher behaviors

In light of changing technologies and rapid globalization, employers expect college graduates to have an extensive skill set, including problem-solving, critical thinking, conflict resolution, and leadership, along with many other higher-order thinking skills (Arum & Roksa, 2011; Association of Public and Land-grant Universities, 2009; National Research Council, NRC, 2009). What is more, the National Research Council argued that employers in the agricultural industry are looking for these skills coupled with an appreciation of agriculture. Accordingly, learning environments in colleges of agriculture are the starting place to prepare graduates for this dynamic workplace. To adequately equip students, effective instruction should provide educational experiences that actively engage students with the content being taught (McLaughlin et al., 2005). The need for active, engaging instruction has been recognized in higher education (Bonwell & Eison, 1991; Braxton, 2006; Svinicki & McKelvie, 2011) and colleges of agriculture (APLU, 2009; NRC, 2009). Consequently, the implementation of more engaging instruction in colleges of agriculture might aid in supplying the workforce with competent, resourceful graduates capable of meeting employers’ needs.

The term student engagement has been widely used in higher education. However, much of the research conducted concerning student engagement has investigated the involvement of students in all aspects of college life (National Survey of Student Engagement, NSSE, 2000). Kuh, Kinzie, Buckley, Bridges & Hayek (2006) proposed that student engagement lies at the intersection of student behaviors and institutional factors and that high levels of student engagement are facilitated by many educational influences, including active and
collaborative learning, faculty-student interactions, and educational environments that are inclusive and affirming with high, clearly communicated expectations for success. Because the learning environment plays a huge role in student engagement, we took a narrower focus on student engagement by examining student cognitive engagement in the learning process.

For this study, cognitive engagement was operationally defined as a psychological investment in learning by students, characterized by cognitive processes including increased mental effort, active attending to, and interaction with the material to be learned (Fredricks, Blumenfeld, & Paris, 2004; McLaughlin et al., 2005; Weinstein & Mayer, 1986). McLaughlin et al. (2005) termed this student content engagement and stated that this is not an assurance of learning, but must be present for learning to take place.

The Student Content Engagement (SCE) model proposed by McLaughlin et al. (2005) served as the frame for this study. The SCE model was chosen for several reasons. First, McLaughlin et al.’s definition of engagement closely aligned with ours. Next, the SCE model deals strictly with the engagement that occurs in the learning environment, and lastly, the constructs of the SCE model encompass an assortment of student and teacher variables, both visible and latent. The four constructs of the model include: (a) subject matter content level, (b) occasion for processing, (c) physiological readiness, and (d) motivation, all of which McLaughlin et al. posited must exist for cognitive engagement to occur.

Smith, Sheppard, Johnson and Johnson (2005) indicated that the primary objective of teachers should be to engage students with the content. To accomplish this, McLaughlin et al. (2005) posited that teachers’ instructional designs and teaching behaviors should incorporate aspects of the four SCE constructs. This qualitative inquiry seeks to build upon the SCE model by investigating specific teacher behaviors that contribute to increased student content engagement.

Subject Matter Content Level

The first construct of the SCE model is Subject Matter Content Level (SMCL). The main premises of the SMCL construct are that first, all new learning is dependent upon a learner’s prior knowledge and second, new knowledge should be introduced to learners at a level just above what learners already know (McLaughlin et al., 2005).

In line with the first premise of SMCL, Piaget and Inhelder (1969) theorized learners’ experiences and prior knowledge help them develop perceptions of the world around them, which they use to make sense of their surroundings. Dewey (1938) suggested that all students enter the classroom with prior knowledge and experiences while Doolittle and Camp (1999) added that learners use this prior knowledge to help interpret new information. In a study of undergraduate agriculture students at the University of Nebraska, Mousel, Moser, and Schacht (2006) discovered that students lacking agricultural background knowledge performed poorer in an introductory agriculture class than students with agricultural background knowledge. In a similar study of undergraduate agriculture students, Greene and Byler (2004) found that students’ agricultural background and whether or not students took high school agricultural classes served as slight predictors of performance in several undergraduate introductory agriculture classes. Results of these studies add evidence to the belief that student background knowledge plays a role in the acquisition of new knowledge.

The second premise of SMCL was that new information should be presented to learners at an appropriate level for learning to occur. Vygotsky (1978) proposed the zone of proximal development, which specified that if students are posed with a task they deem too difficult or too easy, students either give up or choose not to complete the task. Therefore, according to Vygotsky’s recommendations, learning tasks should be at a level that challenges the student but not to the point of being overly difficult. In agriculture, there is a lack of research on the level of difficulty of learning activities relating to cognitive engagement, as defined in this study. However, Whittington and colleagues
(McCormick & Whittington, 2000; Whittington, 1995; Whittington & Newcomb, 1992) have extensively studied cognitive levels of instruction in college of agriculture classrooms as a way to increase critical thinking. McCormick and Whittington (2000) measured the cognitive level of academic challenges of eleven professors in the College of Agricultural Sciences at Penn State University. They found across the different academic challenges (e.g. exams, projects, and problem sets) varying levels of cognition were reached, with exams mostly exhibiting lower levels of cognition while projects and problem sets employed higher levels of cognition. Recommendations by McCormick and Whittington were that professors should deliberately plan activities requiring students to think at higher cognitive levels. A similar study by Newcomb and Trefz (1987), found that 85% of the items on in-class and out-of-class assignments in 16 classes in the College of Agriculture at The Ohio State University required students to think at low cognitive levels. This appears to be an issue throughout colleges of agriculture, as Whittington (1995) revealed, professors in colleges of agriculture desire to teach at higher cognitive levels, but in reality, professors tend to teach at lower cognitive levels.

Occasion for Processing

The second construct proposed by McLaughlin et al. (2005) is Occasion for Processing (OP). OP concerns the learning activities which allow students opportunities for cognitive processing, defined earlier as cognitive engagement. McLaughlin et al. stated OP does not deal with the processing itself, as processing is internal and not readily seen or easily measured. Instead, OP deals with the opportunities students are given to engage in learning activities.

The selection of suitable instructional methods and activities provides the occasion for processing to students. Research by Rosenshine and Furst (1971) revealed that one characteristic of effective teachers is the ability to utilize multiple, varied learning activities, while Hativa (2000) argued mental engagement in these activities leads to student learning. Consequently, Dyer and Osborne (1996) recommended that teachers select and utilize appropriate teaching methods to help ensure the success of students’ learning.

Active learning strategies are an excellent approach to provide the occasion for processing. Svinicki and McKeachie (2011) advocated the use of active learning strategies in the college classroom, which engage students through several different modalities and lead students to higher levels of cognitive thinking. Supporting this idea, Murano and Knight (1999) reported the results of a study, in which students in an introductory food science course were assigned a cooperative learning term project, the purpose of which was to strengthen the communication, higher-order thinking, and creativity skills of the students. Results revealed that students were generally pleased with the experience and indicated gains in their comprehension of the material. In addition, students reported that they were actively engaged with the project and utilized higher level cognitive skills to solve the problems. Many faculty members in colleges of agriculture understand the importance of occasion for processing. Harder, Roberts, Stedman, Thorton, and Myers (2009) surveyed instructors in the College of Agricultural and Life Sciences at the University of Florida concerning teaching competencies, and found that instructors identified engaging students, using active learning strategies, and teaching critical thinking as some of the most relevant teaching competencies.

Physiological Readiness

Physiological readiness (PR) addresses the biological requirements for learning, which McLaughlin et al. (2005) deemed an “important precursor to engagement” (p. 13). Maslow (1943) argued that physiological needs must be met before higher levels of needs can be considered. McLaughlin et al. described five main areas of PR: attention, stress, disabilities, nutrition, and sleep. There is a dearth of research in agricultural education at the postsecondary level concerning physiological readiness factors. However, research has been conducted in education concerning the effects of physiological needs on learning. Studies indicated that
stress (Cohen, Evans, Krantz, & Stokols, 1986), nutrition (Smith, Kendrick, Maben, & Salmon, 1994), and sleep (Pilcher & Walters, 1997) all have an effect on the cognitive functions of students.

Motivation

Many motivational theories exist; however the theory used in the SCE model is the expectancy-value theory of achievement motivation (EVT) (Wigfield & Eccles, 2000). EVT deals with a person’s expectations for success and their perceived value of a task (Wigfield & Eccles, 2000). Students’ expectancies and their value beliefs play a role in the amount of effort they will put forth in the classroom (Velez & Cano, 2008). Pintrich and Schunk (2002) concluded people tend to try harder, persist, and perform better when they expect to do well, while Weiner (1992) suggested students will engage in behaviors consistent with attaining a goal when they see value in reaching that goal. Accordingly, how a student perceives their abilities coupled with the value they place in a course should have an effect on their motivation to engage in classroom tasks. Velez and Cano suggested that teachers should understand and utilize behaviors that lead to increased student motivation.

Purpose

The National Research Agenda has identified meaningful, engaged learning in all environments as a priority (Doerfert, 2011). Consequently, this study of student content engagement should help add insight into this area. The SCE model provides a good framework to study cognitive engagement; however, the SCE model is relatively new, untested, and theoretical in nature and does not provide instructors with practical suggestions for use in the learning environment. This study seeks to identify teacher behaviors that contribute to student engagement with the intent of filling gaps in the model allowing it to be used more pragmatically in the classroom or laboratory. We used the constructs of the SCE model to guide the question development for the focus groups, thus creating a framework upon which students’ discussions were built. Accordingly, the purpose of this qualitative study was to explore the socially constructed perspective of students in a college of agriculture concerning specific teacher behaviors contributing to cognitive engagement using the SCE model as a guide.

Methods

The theoretical perspective for this study was social constructivism. Social constructivism is the belief that knowledge is constructed through social interactions (Flick, 2006). Crotty (1998) stated knowledge is “constructed in and out of interaction between human beings and their world, and developed and transmitted within an essentially social context” (p. 42). In the case of this study, the constructed knowledge of interest was the teacher behaviors that groups of students collectively felt led to cognitive engagement. Because the intent of this study was to examine students’ perceptions of their teachers’ actions, we believed the purpose of this study was best accomplished through the lens of social constructivism. A qualitative methodology that included three focus groups was used in this study. According to Flick (2006), focus groups can be viewed “as a quasi-naturalistic method for studying the generation of social representations or social knowledge in general” (p. 199). As a result, focus groups were deemed an appropriate method for use with a social constructivist theoretical perspective.

Participants for the study were recruited from a large technical writing course in the College of Agricultural and Life Sciences during the spring 2010 semester at the University of Florida. This course was chosen because a wide range of students from a variety of agricultural majors enroll in the course, and students are required to be juniors or seniors. Our belief was that juniors and seniors would have a larger base of classroom experiences to draw upon than younger students, thus generating richer discussions in the groups. To prevent any bias, we had no affiliation with this class. We were allowed to discuss the project at a class session and invite students to participate, and participants were offered an incentive of extra credit points in the class for participating in the study. A total of 29 students volunteered to participate, and three
focus groups were conducted with 12, 12, and 5 participants. Students self-selected which focus groups they attended based on the available dates.

Interview guides were developed using semi-structured questions (Merriam, 1998). This allowed the focus group moderator to guide the discussion, while reacting to and exploring participant responses. Extensive discourse among participants was encouraged by the moderator throughout the focus group to increase the richness of the data. The four constructs of the SCE model (McLaughlin et al., 2005) guided the construction of the open-ended questions for the interview guides, but the four main constructs were not explicitly stated to the participants. Questions were worded in a way that allowed students to think of instructors from their previous courses. Examples of questions from the interview guide included, (1) in what ways have your instructors really made you think about a topic, (2) in what ways have your instructors gotten you back on track and ready to learn, and (3) what things have contributed to the amount of effort you put into a class?

To establish trustworthiness, each focus group was audio-recorded and then transcribed verbatim. Once the focus groups were transcribed, we listened to the recordings a second time to verify the accuracy of the transcriptions (Merriam, 1998). During analysis the primary researcher made the initial categorization of themes and the second researcher reviewed the analysis. We then discussed discrepancies and came to agreement on the categorizations (Merriam, 1998).

For the data analysis, the data were loaded into Weft QDA, which is a downloadable qualitative data analysis program that helps organize the data, and analyzed using a hybrid approach of qualitative methods. The deductive a priori template of codes method delineated by Crabtree and Miller (1999) was used in conjunction with the constant-comparative method (Glaser & Strauss, 1967). Data were first analyzed using the constant-comparative method; responses were categorized and analyzed repeatedly to determine emerging themes. Because participants of the three focus groups were taken from the same class, no attempt was made to determine differences between the groups. Themes that emerged across groups were the themes that were reported. Once the emergent themes were identified, they were grouped and assigned labels. In conjunction with the template of codes method, the emergent themes were then compared to the constructs of the SCE model (McLaughlin et al., 2005) and emergent themes found to be congruent with the SCE constructs were organized under the applicable constructs, while newly emergent themes were presented as possible new constructs.

To comply with Institutional Review Board protocol, confidentiality of the participants was achieved by attributing data to the focus group not the individual participant. The codes for each group were: FG1=Focus Group 1; FG2=Focus Group 2; and FG3=Focus Group 3. In addition to ensuring participant confidentiality, this also helped create an audit trail. Quotes were traceable back to the raw data in Weft QDA using the focus group codes thus helping to ensure confirmability (Erlandson, Harris, Skipper & Allen, 1993).

When conducting a qualitative study, it is appropriate to present researcher biases to provide readers with a lens in which to interpret the results (Merriam, 1998). The primary researcher is a former high school teacher and current doctoral student studying agricultural education. The second researcher is a faculty member in agricultural education. We both believe in creating learner-centered instructional environments in which students are active participants in the learning process.

**Results**

**Subject Matter Content Level**

The first construct of the SCE model was subject matter content level. Emergent themes that fit under this construct were teacher elaboration, difficulty of classes, and student prior knowledge.

**Teacher elaboration.** Students agreed they were more likely to engage when teachers explained content in simple, understandable terms. As one student noted, teachers help him engage in the material when “they talk about it
in our language” (FG 1). Another student said, “If you can also take it and explain it on a level to where we know nothing… for me that helps” (FG 1). Instructional content presented clearly, at an understandable level helped students cognitively “solidify the concepts” (FG 2).

**Difficulty of classes.** Students described having higher levels of cognitive engagement in classes perceived as difficult. “If it’s difficult I would tend to try to keep up with the material a little more” (FG 1). Note-taking, questioning, and overall attention increased when the level of the content was more complicated (FG 1, 2, &3). One student noted, “You’re more…focused in a harder class” (FG 2).

**Student prior knowledge.** Students preferred teachers who take time to assess students’ prior knowledge and connect new information to that knowledge. According to the students, these connections take shape in the form of pre-tests, review questions, movie clips, problem sets, and discussions among others (FG 1, 2, &3). One student stated, “I took this pathogens class where we had a pre-test…and he just wanted to know what exactly we knew coming into the class…and then he kind of tailored his teaching to that” (FG 3). Another student said, “There are a lot of concepts that they [teachers] come in assuming you already know, so they’ll whiz through that material” (FG 3). “Sometimes they [teachers] assume that you know all these things” (FG 1).

**Occasion for Processing**

The second construct of the SCE model was occasion for processing. The emergent themes congruent with this construct were interest approach, daily class structure, discussion, projects, assessment, repetition, questioning, collaborative learning, variability in teaching, problem-based learning, and contextualizing the content with examples.

**Interest approach.** Students believed teachers who utilize an interest approach to begin class helps students get ready to engage. One student described an early morning class where the teacher would play music as everyone ar-
Projects. Most students felt projects were engaging. One student described a semester long project which required periodic class presentations by saying:

[Use of projects] really shows if you’re learning or not, because it shows, not only have you taken the time to go the extra mile and do whatever you can, but it also shows that you have learned the material and you can teach it to someone else. (FG 1)

The types of projects students said they benefitted from most directly applied material from class and used knowledge built throughout the semester. These projects helped students stay engaged because students knew they would need to have a good understanding of the material to complete their projects.

Assessment. Students agreed the most common type of classroom assessment is the multiple choice exam. However, almost all students agreed the type of exam changes the way they engage in the material. Essay tests were regarded as the type of assessment that required the most studying and understanding of a topic (FG 2). However, alternative assessments also helped students cognitively engage and demonstrate the knowledge gained in a class. One student’s example of an alternative assessment was a class presentation: “I had a presentation as an exam grade...that makes you have to make sure that you can effectively teach the class that material too, so it makes you understand” (FG 2).

Repetition. Another aspect of occasion for processing which arose in the focus groups was repetition. Students agreed teachers who use repetition in their teaching help them engage more than teachers who do not use repetition. Some examples of repetitious teacher behaviors described by students were repeating information in class, referring back to material from previous classes, regular quizzes, and homework assignments. One student summarized by saying, “I would say the key is repetition” (FG 1).

Contextualizing the content with examples. Students overwhelmingly agreed that when teachers use examples in class they are more engaged. One student described a teacher who brought in visual aids:

[The teacher] brought in some spoiled goods and it’s stuff that, it’s whenever they go above and beyond and they make sure that you know, ‘I’m gonna reach everyone in the class even the person who’s asleep in the back by bringing in something interesting,’ then that definitely aids in the learning process. (FG 3)

Questioning. Another activity used by teachers which helped engage students was questioning. One student mentioned, “The teacher would call on students, so you are forced to pay attention” (FG 2). Another student declared questioning “does make you sit and think ‘ok, what did I just learn’” (FG 3). The majority of students said if they knew a teacher was prone to question students they would engage more in class.

Collaborative learning. Participants agreed in-class collaborative learning activities helped them engage in class. Students mostly mentioned collaborative learning activities such as group discussions, presentations, and role playing. The consensus among students was that in large or small classes their engagement was increased by group work. “I feel like when people are more engaged in like, group settings then yeah, people are more helpful and I just learn so much more” (FG 3).

Variability in teaching. Students were more engaged when teachers varied their teaching methods. Engaging teachers “won’t just teach something one way, a difficult thing one way, but instead will teach it in multiple fashions” (FG 3). Variability in teaching styles, assignments, classroom activities, and assessments were mentioned as key areas (FG 1, 2, & 3). One student also mentioned he enjoyed guest lecturers because it provided variety which helped him engage more (FG 3).
Problem-based learning. Several students explicitly mentioned problem-based learning as a way to keep students engaged in the material, help them to learn to think critically, and become independent learners. One student said, “It does really help you grasp the material for actually putting it into use while you’re learning” (FG 3). Another student indicated he was interested in medical schools that implemented problem-based learning. He said, “PBL kind of helps you…you know you become a better critical thinker because you have to figure out your own problem” (FG 3).

Physiological Readiness

The third construct was physiological readiness. Emergent themes under this construct included personal stressors, class stressors, and class time.

Personal stressors. Participants indicated that personal stressors lower classroom engagement. Some examples of personal stressors which surfaced were family problems, money issues, employment, and extracurricular activities (FG 1, 2, & 3). In regard to stress, one student stated “I would say I perform a lot more poorly or pay a lot less attention in class” (FG 2). Another student said, “It’s like hard for me to pay attention when I study because I got so much more stuff going through my mind so I feel like that has a really big effect on it” (FG 1). Additionally, one student indicated, “I can study and I do very well in school; but if, you know, something’s going on in my life and I’m just all emotional about that that will ruin everything” (FG 1). Students understand how stress affects their engagement and stated they like when teachers help them through stressful times. One student remarked, “It’s really nice and comforting when teachers and your TAs go above and beyond to help you get back on track” (FG 1).

Class stressors. The effect of classroom stress was the same as personal stress on student engagement, but students believe the teacher can be more help in this area. Most classroom stress mentioned dealt with tests and assignments. One student remarked, “All of a sudden it seems like everything comes due at once or you have tests at once” (FG 2). Other class stressors noted by students were teachers increasing the difficulty of classes, assigning large amounts of reading, and assigning coursework not on the syllabus.

Class time. Students indicated being less engaged in early morning classes. While discussing morning classes one student stated, “It’s a lot harder to learn” (FG 3). Another student described how a teacher helped students in this aspect was by scheduling exams in the evening. The student revealed this helped with studying for and engagement during the exam:

I really like that he schedules his tests at night. That way you don’t have to be prepared to take it like super early in the morning. You just don’t have class in the morning and you take it later in the day. (FG 2)

Motivation

The last construct of the SCE model was motivation. The emergent themes under motivation included relevance, and class reputation.

Relevance. Teachers who connect classroom content with real world applications are more engaging to students. One student said, “If you just go to class and you don’t see the relevance of it, even if it is for a grade it’s going to be hard to engage” (FG 2). Another student stated, “Drawing a connection between what you’re learning and how it could actually apply…finding a way to make it practical I think really would be a good stimulus for students to engage mentally” (FG 2). Skills described by students as being real world were resume writing, interviewing techniques, team building, and critical thinking (FG 1, 2, & 3). One student summarized by asking, “If you’re learning about something that doesn’t have to do with the real world, why learn it” (FG 3)?

Class reputation. Students indicated that they draw upon a variety of resources to determine the reputation of a class. Sources range from peers, to ratemyprofessor.com, to the self-perceived difficulty of the subject. Class
reputation gives students a preconceived idea of the class and/or the teacher and affects student engagement. One student commented, “If I hear…there’s a class that’s difficult I think I would pay closer attention to what the professors are saying because…I won’t be able to do well on the exams if I don’t pay closer attention” (FG 3). Another student observed, “If I hear ahead of time that there’s a professor that’s really, really hard I know this, that I myself stay awake [sic]…whenever I hear that it’s difficult I try to pay closer attention and be more focused” (FG 3).

Teacher Immediacy

An emerging theme that surfaced was teacher immediacy. Students generally mentioned teacher immediacy while discussing motivation, however the theme ran through all of the SCE constructs. Because of this, teacher immediacy was presented as its own construct. The emergent themes grouped under teacher immediacy were personal connection, teacher caring, teacher effort, teacher enthusiasm, and teacher approachability.

Personal connection. Students indicated more of a desire to engage in classes where teachers exhibit a personal connection with students. Examples of personal connections included the use of personal stories in teaching, teachers learning students’ names, and teachers taking an interest in students’ personal lives and goals (FG 1, 2, & 3). The majority of the students said they would be more engaged in a class where teachers use personal examples. Personal stories “make you remember that your teachers are human; because sometimes teachers, you feel like they’re these people that you wonder, do you have a life beyond your subject” (FG 3). Students suggested personal stories helped them relate to their teachers better. Another personal connection factor which students said personalized their experience and made them want to engage more was when teachers learned students’ names. “I think any class where the teachers know your name you’re automatically more inclined to pay attention because you feel like they know, they’ll be watching out for you” (FG 3). The last personal connection was teachers taking an interest in students’ personal lives and goals. Describing one professor, a student said, “She knows all of our names she knows where we’re going, what we’re doing; she made it a point to get to know all of us” (FG 3). Students agreed personal connection to the teacher was a factor that helped them engage in class.

Teacher caring. Students identified teacher caring as an important element leading to student engagement. One student stated, “They [teachers] want you to succeed they don’t want you to walk away from it thinking that it was a waste of time, and if they make that clear to you then it makes you want to be better yourself” (FG 2). Another student agreed, “It makes you care more about the teacher if they care about you, and when you care more about the teacher you want to do good in the class for them” (FG 1). One student gave a specific example by stating:

I have a class…the teacher comes up and asks right before class ‘how are you doing’…and like shows an interest and that really helps. I mean it gets you ready for class and you feel like you want to learn…so many teachers could care less they just go up and start lecturing. (FG 1)

The participants felt a need to perform better when they thought the teacher cared about their learning.

Teacher enthusiasm. Additionally, students stated a preference for teachers who display enthusiasm in their teaching. “I remember [teacher] from biology, he was really energetic in how he taught it, and the whole time I was able to pay attention” (FG 3). Another student remarked, “When professors are passionate about it, I would be engaged and listening and learning the entire time…For me it makes a big difference, because I have seen the effects of passionate and not passionate teachers” (FG 1).

Teacher effort and teacher approachability.

Teacher effort and approachability were the last two teacher immediacy factors which surfaced during the focus groups. Students felt each of these teacher characteristics contributed
to student engagement in a positive way. In response to teacher effort one student said, “If I see a teacher putting a lot of effort into his class...I am going to want to work harder in return because I feel they’re putting their side of the effort in” (FG 2). Teacher approachability was considered crucial by students for classroom engagement. One student said, “If you’re approachable then the students are not going to be intimidated to learn, and they’re not going to be as scared to ask questions” (FG 3).

Conclusions/Recommendations

Results of this study revealed that within the SCE framework (McLaughlin et al., 2005) a multitude of observable, measurable teacher behaviors exist (See Table 1). The subject matter content level results were consistent with prior research. Students indicated they were more engaged when material was presented at challenging, yet understandable levels corresponding to Vygotsky’s (1978) work. In addition, students reported increases in engagement when teachers made an effort to assess prior knowledge and connect prior knowledge to information being taught, which is in accordance to the work of Dewey (1938) and Doolittle and Camp (1999).

A variety of behaviors contributing to student cognitive engagement surfaced within the occasion for processing construct. Student engagement was enhanced by instructors’ use of specific active learning activities such as discussions, projects, collaborative learning, and questioning. These findings were consistent with previous research on teaching and learning (Bonwell & Eison, 1991; Hativa, 2000; Smith, Sheppard, Johnson & Johnson, 2005). The use of varying instructional methods also contributed to students’ perceptions of their level of engagement. Rosenshine and Furst (1971) considered variability in instruction a characteristic of effective teachers. In addition, participants specifically mentioned problem-based learning as a teaching method that promotes cognitive engagement.

Table 1

Summary of Emergent Themes for the Constructs of the Student Content Engagement Model

<table>
<thead>
<tr>
<th>Subject Matter Content Level</th>
<th>Occasion for Processing</th>
<th>Physiological Readiness</th>
<th>Motivation</th>
<th>Teacher Immediacy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teacher Elaboration</td>
<td>Interest Approach</td>
<td>Personal Stressors</td>
<td>Relevance</td>
<td>Personal Connection</td>
</tr>
<tr>
<td>Class Difficulty</td>
<td>Daily Class Structure</td>
<td>Class Stressors</td>
<td>Class Reputation</td>
<td>Teacher Caring</td>
</tr>
<tr>
<td>Prior Knowledge</td>
<td>Class Discussion Projects Questioning Collaborative Learning Problem-based Learning Repetition Variability Contextualizing Content with Examples Type of Assessment</td>
<td>Class Time</td>
<td>Teacher Effort Enthusiasm Approachability</td>
<td></td>
</tr>
</tbody>
</table>

Physiological readiness factors that influenced participants’ cognitive engagement were personal stressors, class stressors, and class time. Personal stress included such factors as family problems, employment, sickness, tiredness, money problems, and extracurricular activities. While instructors have little influence over personal stressors, they can help students through stressful times. Instructors need to understand that students’ physiological needs must be met before cognitive engagement can take place (Maslow, 1943).
For motivation, relevance and class reputation surfaced as themes contributing to student engagement. These themes seemingly align with the expectancy-value theory of motivation (Wigfield & Eccles, 2000). However, students indicated they tended to engage more in classes having a reputation as being difficult. Motivational theory would suggest that students engage more when they have a high degree of expectancy for success, but the students in this study reported that they were more engaged in classes perceived as difficult. These results are puzzling because, according to theory, the perceived difficulty of the class should lower students’ self-efficacy and thus their expectancy for success. Additionally, in accordance with the value portion of the expectancy-value theory, the theme of relevance showed that students tend to be more engaged in classes they perceive as valuable to their future.

One interesting finding from this study was the emergence of teacher immediacy. After an examination of the themes of teacher immediacy: teacher caring, teacher effort, teacher enthusiasm, teacher approachability, and personal connection, the determination was made that these closely align with the nonverbal and verbal immediacy behaviors outlined by Gorham and associates (Gorham, 1988; Richmond, Gorham, & McCroskey, 1987). Our initial thought was that the teacher immediacy factors should be grouped into the motivation construct because teacher immediacy has been previously linked with motivation (Kelley & Gorham, 1988; Velez & Cano, 2008). However, past research has suggested that immediacy influences motivation as opposed to being integrated into motivation (Christophel, 1990; Frymier, 1994). The findings of this study point to the work by Christophel (1990) and Frymier (1994); teacher immediacy did not appear to directly influence cognitive engagement, instead influencing students’ motivation to engage.

The results of this study represent only a small number of students in the College of Agricultural and Life Sciences at the University of Florida and are not generalizable farther than the sample. However, several recommendations can be made from the results. First, classroom teachers should put forth the effort to assess students’ existing knowledge in order to link new material to that knowledge. Students do not come to the classroom with a blank slate, and learning theory would state that teaching is more effective when new knowledge is linked to existing knowledge (Dewey, 1938). Second, teachers should attempt to use a variety of active learning strategies that might include discussions, questioning, collaborative group work, projects, presentations, problem-based learning, and role play as outlined by Braxton (2006). Problem-based learning and various other active learning activities designed to foster critical thinking skills increase the cognitive level of teaching in the classroom tying into work by Whittington and colleagues (McCormick & Whittington, 2000; Whittington, 1995; Whittington & Newcomb, 1992; Whittington, Stup, Bish, & Allen, 1997). Additionally, while teachers may not have a direct effect on the physiological readiness of students, they can understand students’ physical and emotional needs and attempt to accommodate students. Instructors who are empathetic to students’ needs might be viewed more favorably by students, thus giving students an increased impetus to engage in class. Lastly, student engagement might be increased when instructors utilize teacher immediacy behaviors in the classroom. Instructors could employ verbal and nonverbal immediacy behaviors, such as calling students by name, using personal stories or examples, moving around the classroom while teaching, smiling at students, and praising students’ work and comments. Use of these types of immediacy behaviors might help make instructors seem more approachable to students, thus increasing motivation. In addition, faculty development programs aimed at helping instructors understand the importance of integrating active, engaging learning activities into their classrooms, as well as to helping instructors understand how to motivate students to engage in classroom learning could prove beneficial.

While small in scope, the results of this study help expand the knowledge concerning teacher behaviors’ contribution to student content engagement. However, this study generated more questions that warrant further investigation. Replications of this study should be conducted to determine if the teacher variables discovered in this study are consistent
among groups of students in other colleges of agriculture, as well as other educational settings. Additionally, inquiries should be made to determine the relationships of these teacher behaviors with student achievement. This study found that students engaged more in classes they deemed as difficult. Further research should investigate students’ perceptions of and motivation in classes with a reputation for being difficult. Furthermore, an instrument measuring students’ perceptions of specific teacher behaviors that predict engagement should be created. Lastly, an examination of the influence of teacher immediacy on motivation and cognitive engagement should be made.

References


CHRISTOPHER M. ESTEPP is an Assistant Professor of Agricultural Education in the Department of Animal Science at Sul Ross State University, Box C-11, Alpine, TX 79832, cestepp@sulross.edu

T. GRADY ROBERTS is an Associate Professor of Agricultural Education in the Department of Agricultural Education and Communication at the University of Florida, 307B Rolfs Hall, Gainesville, FL 32611, groberts@ufl.edu
Identification and Validation of Agricultural Hazardous Occupations Order Certification Program Instructor Criteria and Competencies

Shannon Snyder  
Purdue University

Brian French  
Washington State University

William Field  
Roger Tormoehlen

Daniel Ess  
Purdue University

The USDA/NIFA has awarded funding to Land Grant Institutions to conduct and enhance the Hazardous Occupations Safety Training in Agriculture (HOSTA) program. The HOSTA program is designed to provide relevant educational opportunities in an effort to reduce the frequency and severity of farm-related injuries to all youth who work in agricultural production and to meet the current training requirements of the Agricultural Hazardous Occupations Order (AgHOs) for non-exempt youth. The Cooperative Extension Service and secondary school agricultural science and business programs are designated by the AgHOs as the only entities eligible to conduct and affirm completion of certification training. However, the law does not identify the minimum core competencies necessary for instructors and there are currently no evidence-based criteria to assess the preparedness of individuals who provide instruction to youth seeking AgHOs certification. One of the objectives of the current HOSTA project at Purdue University is to identify and validate minimum criteria and desired core competencies for instructors who conduct certification training. This paper summarizes the findings of the validation process and reports on the core criteria and competencies identified.

Keywords: Agricultural safety, Agricultural Hazardous Occupations Safety Training, AgHOs, Hazardous Occupations Safety Training in Agriculture, HOSTA, Instructor training, Farm safety for youth.

The United States Department of Agriculture’s (USDA) National Institute of Food and Agriculture (NIFA) has provided funding under the provisions of the Employment of Youth in Agriculture Program to develop and support the current Hazardous Occupations Safety Training in Agriculture (HOSTA) initiative (Employment of Youth in Agriculture, 2005). The HOSTA program provides relevant safety and health educational opportunities for youth engaged in agricultural production activities in an effort to reduce the rate of farm-related injuries to youth, especially youth less than 16 years of age. HOSTA program funds have been allocated on a competitive basis to Land Grant Institutions to enhance agricultural safety and health programming nationwide. One goal of the HOSTA project at Purdue University has been to identify and validate minimum criteria and desired core competencies for agricultural safety instructors participating in the certification training required by the current Agricultural Hazardous Occupations Order (AgHOs) of 1968 as listed in Subpart E-1 of Part 1500 of Title 29 of the Code of Federal Regulations, an amendment to the Fair Labor Standards Act of 1938 (United States Department of Agriculture, 2010). This effort was designed to build upon the currently identified criteria specified in the law and attempt to validate an expanded set of
evidence-based criteria and competencies that reflect changes in the training and experience of eligible instructional personnel, agricultural practices, and technology over the past 40 years. The effort would also contribute to enhancing the capacity of other agricultural and youth educators to provide effective agricultural safety and health instruction.

Recent, however, unsuccessful, proposed changes to the AgHOs held the potential to further limit youth participation in agricultural tasks on a for hire basis. Several AgHOs task areas would have been expanded to further clarify and restrict participation by both youth under 16 and those enrolled in supervised agricultural work experiences (United States Department of Labor, 2011a). The proposed changes would have also removed the current exemption that permits youth ages 14-15 years old to perform certain agricultural tasks for hire, provided they have completed an approved training course. These proposed changes were justified partially on the argument that current AgHOs training lacked instructional consistency (United States Department of Labor, 2011b). The necessity for instructors of these programs to possess minimum criteria and competencies was perceived as a gap in the effort to provide effective outcome based education and training to youth exposed to agricultural hazards.

Based on a review of literature, no evidence-based criteria were identified that could be used to assess the preparedness of individuals to provide instruction to youth seeking AgHOs certification. The only general criterion identified in the language of the AgHOs is that certification be authorized by a “Cooperative Extension Service agent” or conducted by a “vocational agriculture teacher” (Part 570—Child labor regulations, orders, and statements of interpretation, 2010). The roles and preparation of these professionals have evolved substantially since the AgHOs originally identified these two groups of educators in 1968. These changes have resulted in individuals who are eligible to teach by position, but who possibly lack the necessary experience, criteria, skill sets, and knowledge to provide the desired levels of instruction.

The goal of the Purdue University instructor training component of the HOSTA program was to build upon the criteria that were specifically identified or implied by the current AgHOs and enhance them through an evidence-based process to more closely match the current curriculum needs and changing characteristics of available instructors. This work is situated at the intersection of validity theory and curriculum development theory. The authors relied on the practical approach of building a validity argument (e.g., Kane, 2006) based on evidence to support the content that is essential to this domain (Porter, 2002; 2006) with the forethought of how this information will be assessed and interpreted in practice while relying on the practical approaches to developing curriculum (e.g., Ornstein & Hunkins, 2004; Tanner & Tanner, 2006) that is useful without engaging in the debate on which approach is most appropriate. That debate is beyond the scope of the paper. However, the systematic approach used follows standard practice. What can be seen within the framework, for instance, in interviews with agricultural teacher educators as well as currently employed agricultural educators, was an indication that meeting the current criteria, especially with the changing roles and educational experience of most extension educators and agricultural education teachers, no longer indicates that an individual was in possession of the desired competencies to effectively teach youth how to safely work in agricultural production. Consequently, the need to develop minimum criteria and core competencies for instructors was identified.

These criteria and competencies could then serve as a guide to develop, pilot test, and implement resources and training strategies that would improve the quality of both AgHOs certification specifically and agricultural safety and health instruction in general nationwide. Findings would also be helpful in providing evidence-based guidance for revisions to the current AgHOs in order to more closely reflect changing public expectations as well as current farm-related injury data involving youth.

Statement of the Problem

The current requirements for instructors of certification programs, as prescribed by the
AgHOs of 1968, are no longer adequate due to changing demographics, backgrounds, training and experience levels, along with changes in agricultural technology and practices. There is a need for evidence based and documentable selection criteria and minimum core competencies for these instructors to ensure youth receive training that is consistent with the AgHOs requirements and that adequately addresses the most significant hazards associated with current agricultural production processes and practices. Unlike most youth directed instruction in agriculture, this training is designed specifically to reduce the frequency of injuries and fatalities to this population. The consequences of ineffective instruction can be much more critical than outcomes in other areas due to poor instruction.

**Research Questions**

This research addressed the question of identifying the general criteria, including cognitive and behavioral competencies, and prerequisites desired and required of instructors of AgHOs certification programs to ensure that the instruction prepares youth to perform tasks especially hazardous in agriculture. In addition, the strategies that can be used to reliably assess these competencies and/or prerequisites were validated through the review process involving multiple data points and persons with expertise in the appropriate areas.

**Materials and Methods**

The authors reviewed past and currently available instructional resources used in AgHOs certification programs and general agricultural safety and health curricula used across the country to develop an initial framework of the minimum criteria and desired core competencies. Nearly all of these materials were based upon the original directives found in the language of the AgHOs (Part 570—Child labor regulations, orders, and statements of interpretation, 2010) that specified content from the original 4-H tractor and machinery manuals 1-4 that predated the AgHOs. These curricula have matured over time and the most recent include the National Safe Tractor and Machinery Operator Program (NSTMOP, 2006) and Gearing Up for Safety: Agricultural Production Safety Training for Youth (Gearing Up for Safety, 2003). Using the Gearing Up for Safety list of minimum desired core competencies for youth validated by Ortega (2011) as a guide, a list of corresponding instructor competencies was composed. This list was reviewed internally by a panel of experts comprised of the National HOSTA Advisory Committee.

**The Questionnaire**

An electronic questionnaire was developed from the list of identified instructor competencies that was again reviewed by the National HOSTA Advisory Committee, and pilot tested with a convenience sample of current instructors of AgHOs certification courses. The revised questionnaire was imported into the Qualtrics web-based survey software to facilitate electronic distribution. The questionnaire was password-protected with the password sent to potential respondents via email. Responses to the questionnaire would remain anonymous; however, it was necessary to isolate non-respondents in order to send reminders per the Tailored Design Method (Dillman, 2000; Dillman, 2007). Thus, potential respondents were assigned a randomly generated personal identification number. The questionnaire protocol required this number following the password request. The electronic questionnaire was divided into two sections: content-related items and demographic information. Included in the content-related section were 51 criteria or competency items. Respondents ranked each item on a five-point Likert scale according to their perception of importance of the criteria or competency for qualified instructors. The demographic section included 24 questions pertaining to respondents’ teaching experience, occupation, education, and curriculum use.

**Data Collection Method**

The procedure for gathering data followed Dillman’s Tailored Design Method (2000, 2007). The questionnaire was distributed via a
link included in an email message, as was respondents’ passwords and personal identification numbers (PIN). Data was summarized using mean, median, mode, range, and standard deviation for each criterion or competency. Calculations were performed using Microsoft Excel.

**Population Surveyed**

The population surveyed was identified from the NSTMOP Community Lead Instructors list and the Gearing Up for Safety Instructor Database. This population of 791 individuals, who had participated in AgHOs instructor training and self identified as AgHOs instructors, was selected as a source for potential respondents due to the belief they had the best knowledge of what it takes to be an effective instructor. Administrators of each database granted approval to use the contact information, and Information Technology (IT) personnel generated and assigned random numbers to each entry. The numbers would be used by IT personnel to determine non-response.

The NSTMOP database contained a total of 524 entries. Removal of entries due to duplications and absent email addresses resulted in a total of 426 potential respondents. The Gearing Up for Safety Instructors database contained a total of 267 entries. Removal of entries for the same reasons resulted in 257 total potential respondents. This resulted in 683 total potential respondents with email addresses prior to the sending of any data collection materials. The final useable sample was 507, representing 46 states, after controlling for invalid email addresses.

By the culmination of the study, four email messages requesting data had been sent to each potential respondent. The resulting response rate was 49% (N = 249).

Non-response error was controlled by randomly selecting ten percent of non-respondents using their identification number. An attempt to contact each of these instructors was made by phone. If contact was made, the instructor was asked to complete the questionnaire orally with the response recorded in a separate electronic database. Through repeated contacts over 8 weeks, only five responses were achieved. This was an insufficient amount to conduct statistical tests with adequate statistical power to determine the extent of non-response bias.

**Validation**

A panel of 11 experts in occupational and educational fields pertaining to agricultural safety was assembled to validate data gathered. The perspectives presented by panel members were directed toward the development of an agricultural safety instructor curriculum. This was consistent with prior work of Kingman, Yoder, Hodge, Ortega, & Field (2005) as an approach to developing a curriculum. The panel was presented with the criterion and competency data collected from the 249 respondents in summary form. Competency-related feedback generated by the panel was gathered as written perspectives of time and emphasis ranking for each competency. Criterion-related feedback was collected in the form of yes/no responses to the question of whether each criterion should be included as a component of an AgHOs instructor curriculum.

**Limitations**

The population referred to in this study was limited to instructors of agricultural safety programs who had received training by Pennsylvania State University or Purdue University as a part of the HOSTA program. Perspectives from agricultural safety instructors not included in these two groups hold the potential to influence the results reported here.

Data collection for the study was electronic-based only, which limited the results to those respondents who are users of electronic-based media including email. Responses from instructors who do not use electronic-based media were not determined.

**Results and Discussion**

**Criteria Ranking by Survey Respondents**

Criteria were defined as the minimal qualifications for persons seeking to provide
instruction to youth participating in agricultural safety programs designed to meet or exceed AgHOs requirements. There were 15 criteria identified in the review process that were in the questionnaire. One open ended question sought input from participants as to the minimum age believed necessary for AgHOs instructors. Descriptive statistics for the perceived level of importance of criteria as ranked by respondents are shown in descending order in Table 1. Responses were ranked on a five-point Likert scale with 5 representing most important.

Table 1
Distribution of Current AgHOs Safety Instructors' Perception of Importance of Instructor Criteria
(n = 249)

<table>
<thead>
<tr>
<th>Instructors of agricultural tractor and machinery safety programs should:</th>
<th>M</th>
<th>SD</th>
<th>Range</th>
<th>Mode</th>
<th>Median</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Be at least 18 years old</td>
<td>4.64</td>
<td>0.64</td>
<td>3-5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>2. Demonstrate mastery of the primary language necessary for instruction</td>
<td>4.47</td>
<td>0.76</td>
<td>1-5</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>3. Possess a valid driver’s license</td>
<td>4.35</td>
<td>0.97</td>
<td>1-5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>4. Have received formal safety training through classes, seminars, or training opportunities</td>
<td>4.22</td>
<td>0.90</td>
<td>1-5</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>5. Have passed (minimum 70 percent correct) a written test that addresses the basic requirements of the AgHOs (Agricultural Hazardous Occupations Order)</td>
<td>4.05</td>
<td>0.99</td>
<td>1-5</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>6. Submit to a criminal background check</td>
<td>3.97</td>
<td>1.22</td>
<td>1-5</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>7. Possess at least 3 years of agricultural equipment operation experience</td>
<td>3.78</td>
<td>1.12</td>
<td>1-5</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>8. Have first aid training</td>
<td>3.43</td>
<td>1.10</td>
<td>1-5</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>9. Have a minimum of 3 years agricultural production experience</td>
<td>3.41</td>
<td>1.18</td>
<td>1-5</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>10. Carry professional liability insurance</td>
<td>3.30</td>
<td>1.33</td>
<td>1-5</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>11. Be a secondary school agricultural education instructor</td>
<td>2.81</td>
<td>1.26</td>
<td>1-5</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>12. Have at least 3 years teaching experience at any level</td>
<td>2.76</td>
<td>1.25</td>
<td>1-5</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>13. Possess a secondary school teaching certificate</td>
<td>2.74</td>
<td>1.38</td>
<td>1-5</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>14. Be an extension educator/agent</td>
<td>2.71</td>
<td>1.18</td>
<td>1-5</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>15. Possess FEMA (Federal Emergency Management Agency) emergency preparedness certification</td>
<td>1.99</td>
<td>1.03</td>
<td>1-5</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>16. What should be the minimum age for instructors of agricultural safety programs?</td>
<td>21.32</td>
<td>2.36</td>
<td>14-30</td>
<td>21</td>
<td>21</td>
</tr>
</tbody>
</table>

Note. Scale: M = 1.00-1.50 = Low Importance, M = 1.51-2.50 = Moderately Low Importance, M = 2.51-3.50 = Moderate Importance, M = 3.51-4.50 = Moderately High Importance, M = 4.51-5.00 = High Importance.

Respondents provided a mean ranking of all criteria between moderately low importance (M = 1.51-2.50) and high importance (M = 4.51-5.00). According to respondents’ perceptions, being at least 18 years old was the only high importance (M = 4.51-5.00) criteria (M = 4.64; SD = 0.64).

Those criteria that received a mean ranking by respondents as moderately high importance (M = 3.51-4.50) included: “demonstrate a mastery of the primary language necessary for instruction,” “possess a valid driver’s license,” “have received formal safety training through classes, seminars, or training opportunities,” “have passed (minimum 70 percent correct) a written test that addresses the basic requirements of the AgHOs,” “submit to a criminal background check,” and “possess at least 3 years of agricultural equipment operation experience.”

Seven criteria received a mean ranking by respondents as moderate importance (M = 2.51-3.50) including: “have first aid training,” “have a
minimum of 3 years agricultural production experience,” “carry professional liability insurance,” “be a secondary school agricultural education instructor,” “have at least 3 years teaching experience at any level,” “possess a secondary school teaching certificate,” and “be an extension educator/agent.”

Although no criteria received a mean ranking of low importance \((M = 1.00-1.50)\), one criterion, “possess FEMA (Federal Emergency Management Agency) emergency preparedness certification,” received a mean ranking of moderately low importance \((M = 1.51-2.5)\).

Data gathered by the electronic questionnaire also indicated that instructors should be at least 18 years old \((M = 4.64, SD = 0.64)\). When respondents were asked to specifically identify the minimum age necessary for effective instruction of agricultural safety, the mean response was 21 years \((M = 21.21, SD = 2.73)\). Under the current provisions of the AgHOs, it is unlikely to have an individual under the age of 21 meet the criteria of being either an Extension educator or a vocational agriculture teacher. However, findings suggest that respondents may see a role for those 18-21 to assist in program delivery, assisting a lead instructor.

Criteria ranked of higher importance tended to also have a lower standard deviation, indicating less variability in responses and more agreement on high importance. The lowest ranked criterion, “possess FEMA (Federal Emergency Management Agency) emergency preparedness certification,” had a lower standard deviation than did other criteria ranked with a lower importance.

### Criteria Validation

The assessment of the results from the expert panel members is included as Table 2. These findings were based upon preliminary written rankings and led discussions.

<table>
<thead>
<tr>
<th>Instructors of agricultural tractor and machinery safety programs should:</th>
<th>(M)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Demonstrate mastery of the primary language necessary for instruction</td>
<td>1.00</td>
</tr>
<tr>
<td>2. Submit to a criminal background check</td>
<td>1.00</td>
</tr>
<tr>
<td>3. Possess a valid Driver’s License</td>
<td>0.91</td>
</tr>
<tr>
<td>4. Have received formal safety training through classes, seminars, or training opportunities</td>
<td>0.82</td>
</tr>
<tr>
<td>( \cdot ) Possess at least 3 years of agricultural equipment operation experience</td>
<td>0.82</td>
</tr>
<tr>
<td>6. Have first aid training</td>
<td>0.73</td>
</tr>
<tr>
<td>7. Be at least 18 years old</td>
<td>0.64</td>
</tr>
<tr>
<td>8. Have a minimum of 3 years agricultural production experience</td>
<td>0.27</td>
</tr>
<tr>
<td>9. Have passed (minimum 70 percent correct) a written test that addresses the basic requirements of the AgHOs (Agricultural Hazardous Occupations Order)</td>
<td>0.18</td>
</tr>
<tr>
<td>10. Carry professional liability insurance</td>
<td>0.09</td>
</tr>
<tr>
<td>11. Be a secondary school agricultural education instructor</td>
<td>0.09</td>
</tr>
<tr>
<td>12. Have at least 3 years teaching experience at any level</td>
<td>0.00</td>
</tr>
<tr>
<td>13. Possess a secondary school teaching certificate</td>
<td>0.00</td>
</tr>
<tr>
<td>14. Be an extension educator/agent</td>
<td>0.00</td>
</tr>
<tr>
<td>15. Possess FEMA (Federal Emergency Management Agency) emergency preparedness certification</td>
<td>0.00</td>
</tr>
</tbody>
</table>

**Note.** Scale: 1 = Yes, 0 = No

Data gathered from the panel indicated strong agreement \((M > 0.75)\) in terms of which criteria an instructor should meet. Those criteria included: “demonstrate mastery of the primary language necessary for instruction,” “possess a valid driver’s license,” “have received formal safety training through classes, seminars, or training opportunities,” “submit to a criminal...
Panel members drew from their personal and professional experience to set the cut score for inclusion of criteria in an instructor curriculum at 0.5. The criterion ranked above the cut score, but not strongly agreed upon by the panel members was: “be at least 18 years old.” The rationale that influenced this ranking was that many panel members believed 21 years old to be a more appropriate minimum age for instructors of agricultural safety programs.

Panel members unanimously ranked four criteria to not be included \((M = 0.00)\). The criteria not considered relevant were: “have at least three years teaching experience at any level,” “possess a secondary school teaching certificate,” “be an extension educator/agent” (which is inconsistent with the current provisions of the AgHOs), and “possess FEMA (Federal Emergency Management Agency) emergency preparedness certification.”

Eight criteria that had been ranked of Moderately High Importance \((M = 3.51-4.50)\) to Moderately Low Importance \((M = 1.51-2.50)\) by respondents to the questionnaire were determined to be of low importance for two primary reasons. 1. Some criteria, for example: “instructors of agricultural tractor and machinery safety programs should have passed (minimum 70 percent correct) a written test that addresses the basic requirements of the AgHOs,” would not facilitate sustainability of the program since oversight to periodically monitor, maintain, update, administer, and/or grade the tests would be necessary. 2. Other criteria, such as: “instructors of agricultural tractor and machinery safety programs should possess a secondary school teaching certificate,” were determined by the panel to present undue occupation-related restrictions to otherwise qualified instructors. Criteria that met this rationale were found, in many cases, to be addressed by cooperating agencies such as 4-H or school systems that sponsor agricultural safety training for youth.

Indications based upon verbal feedback from the panel determined that AgHOs safety certification instructor programs should be designed as self-sustaining to prepare potential instructors with at least the minimum required knowledge and skills necessary to teach agricultural safety to youth. As such, it was the panel’s position that only those criteria that were not addressed by other related, sponsoring, or cooperating entities should be included.

**Competency Ranking by Survey Respondents**

Competencies were defined as knowledge and skills acquired as a result of training, experience, or education. Included in the electronic questionnaire were 36 competencies that current instructors were asked to rank in terms of importance for mastery by instructors. The perceived levels of importance of competencies are shown in descending order in Table 3, ranked on a five-point Likert scale.
### Table 3

**Distribution of Current AgHOs Safety Instructors’ Perception of Importance of Selected Competencies (n = 249) with Ranking of Instructional Time Allocation to Competencies by Expert Panel (N = 11) in parentheses**

| Rank | Instructors should possess knowledge in the following areas: | $M$   | $SD$   | Range | Mode | Median |
|------|------------------------------------------------__________|-------|--------|-------|------|--------|
| 1. (34) | Effective communication with the intended audience | 4.57 (1.73) | 0.63 (1.27) | 2-5 (1-5) | 5 (1) | 5 (1) |
| 2. (1) | Identification and explanation of the function and location of safety features and devices found on tractors | 4.52 (4.55) | 0.67 (0.69) | 2-5 (3-5) | 5 (5) | 5 (5) |
| 3. (3) | Basic operating principles of PTO powered agricultural machinery | 4.51 (4.27) | 0.76 (1.01) | 1-5 (2-5) | 5 (5) | 5 (5) |
| 4. (2) | Safe operation procedures relative to tractor component basics | 4.50 (4.55) | 0.75 (0.82) | 1-5 (3-5) | 5 (5) | 5 (5) |
| 5. (5) | Identification of basic tractor components | 4.45 (4.09) | 0.74 (0.94) | 2-5 (3-5) | 5 (5) | 5 (4) |
| 6. (6) | General awareness of agricultural hazards | 4.44 (3.91) | 0.77 (0.93) | 1-5 (3-5) | 5 (4) | 5 (4) |
| 7. (7) | Proper use of personal protective equipment | 4.37 (3.82) | 0.87 (0.97) | 1-5 (3-5) | 5 (3) | 5 (4) |
| 8. (8) | Identification and explanation of the function and location of basic integral components found on powered agricultural machines | 4.34 (3.64) | 0.77 (0.81) | 2-5 (3-5) | 5 (3) | 5 (3) |
| 9. (4) | Safe operation of powered agricultural machinery | 4.32 (4.18) | 0.86 (0.87) | 1-5 (3-5) | 5 (5) | 5 (4) |
| 10. (30) | Demonstrated ability to access materials and facilities required for successful safety training programs | 4.32 (2.09) | 0.70 (1.04) | 1-5 (1-4) | 4 (1) | 4 (2) |
| 11. (9) | Safe operation of a tractor through a structured course | 4.31 (3.55) | 0.88 (1.21) | 1-5 (2-5) | 5 (5) | 5 (4) |
| 12. (11) | Safe practices when working with hydraulics | 4.25 (3.45) | 0.81 (1.36) | 1-5 (1-5) | 5 (5) | 4 (3) |
| 13. (17) | Laws and regulations that apply to youth working in agricultural workplaces | 4.18 (2.91) | 0.83 (1.51) | 1-5 (1-5) | 4 (3) | 4 (3) |
| 14. (20) | Meanings associated with standard safety colors | 4.17 (2.73) | 0.86 (1.01) | 1-5 (1-4) | 5 (3) | 4 (3) |
| 15. (31) | Access to knowledgeable individuals within the local community | 4.15 (2.09) | 0.73 (0.94) | 1-5 (1-4) | 4 (2) | 4 (2) |
| 16. (14) | Safe practices for operating ATVs | 4.10 (3.09) | 0.97 (1.22) | 1-5 (1-5) | 5 (3) | 4 (3) |

(Table 3 continues)
(Table 3 continued)

<table>
<thead>
<tr>
<th>Rank</th>
<th>Instructors should possess knowledge in the following areas:</th>
<th>M</th>
<th>SD</th>
<th>Range</th>
<th>Mode</th>
<th>Median</th>
</tr>
</thead>
<tbody>
<tr>
<td>17. (16)</td>
<td>Required procedures for entering agricultural confined spaces such as grain bins, silos, etc.</td>
<td>4.08 (3.09)</td>
<td>1.04 (1.64)</td>
<td>1-5 (1-5)</td>
<td>5 (1)</td>
<td>4 (3)</td>
</tr>
<tr>
<td>18. (26)</td>
<td>Locating appropriate safety resources</td>
<td>4.07 (2.55)</td>
<td>0.93 (1.37)</td>
<td>1-5 (1-5)</td>
<td>4 (3)</td>
<td>4 (3)</td>
</tr>
<tr>
<td>19. (21)</td>
<td>Fire safety and suppression</td>
<td>4.05 (2.64)</td>
<td>0.96 (1.03)</td>
<td>1-5 (1-5)</td>
<td>5 (3)</td>
<td>4 (3)</td>
</tr>
<tr>
<td>20. (10)</td>
<td>Agricultural practices and structures that could yield or contain toxic gases and/or entrapment in a toxic environment</td>
<td>4.02 (3.55)</td>
<td>0.97 (0.93)</td>
<td>1-5 (2-5)</td>
<td>5 (3)</td>
<td>4 (3)</td>
</tr>
<tr>
<td>21. (35)</td>
<td>Demonstrated record keeping skills</td>
<td>3.98 (1.55)</td>
<td>0.86 (0.82)</td>
<td>1-5 (1-3)</td>
<td>4 (1)</td>
<td>4 (1)</td>
</tr>
<tr>
<td>22. (12)</td>
<td>Safe operating procedures for skid steer loaders</td>
<td>3.95 (3.36)</td>
<td>1.05 (1.36)</td>
<td>1-5 (1-5)</td>
<td>4 (5)</td>
<td>4 (3)</td>
</tr>
<tr>
<td>23. (13)</td>
<td>Electrical safety</td>
<td>3.95 (3.36)</td>
<td>1.02 (1.03)</td>
<td>1-5 (2-5)</td>
<td>4 (4)</td>
<td>4 (4)</td>
</tr>
<tr>
<td>24. (22)</td>
<td>General agricultural practices that focus on various agricultural machines, methods, practices, procedures, crops, livestock, and other related agricultural areas</td>
<td>3.91 (2.64)</td>
<td>0.89 (1.36)</td>
<td>1-5 (1-5)</td>
<td>4 (2)</td>
<td>4 (2)</td>
</tr>
<tr>
<td>25. (18)</td>
<td>Safe animal handling techniques</td>
<td>3.88 (2.82)</td>
<td>1.08 (1.47)</td>
<td>1-5 (1-5)</td>
<td>4 (3)</td>
<td>4 (3)</td>
</tr>
<tr>
<td>26. (23)</td>
<td>Animal behavior characteristics</td>
<td>3.85 (2.64)</td>
<td>1.09 (1.57)</td>
<td>1-5 (1-5)</td>
<td>4 (1)</td>
<td>4 (3)</td>
</tr>
<tr>
<td>27. (15)</td>
<td>Safe operation of farm vehicles with the primary purpose of carrying passengers</td>
<td>3.73 (3.09)</td>
<td>1.18 (1.51)</td>
<td>1-5 (1-5)</td>
<td>5 (5)</td>
<td>4 (3)</td>
</tr>
<tr>
<td>28. (33)</td>
<td>Up to date technologies (computers, DVDs, webinars, online forums, etc.) used for safety instruction</td>
<td>3.72 (1.91)</td>
<td>1.01 (0.70)</td>
<td>1-5 (1-3)</td>
<td>4 (2)</td>
<td>4 (2)</td>
</tr>
<tr>
<td>29. (19)</td>
<td>Procedures to safely handle restricted use agricultural chemicals</td>
<td>3.68 (2.82)</td>
<td>1.18 (1.66)</td>
<td>1-5 (1-5)</td>
<td>4 (1)</td>
<td>4 (3)</td>
</tr>
<tr>
<td>30. (24)</td>
<td>Procedures for safely handling anhydrous ammonia (NH₃)</td>
<td>3.68 (2.64)</td>
<td>1.15 (1.69)</td>
<td>1-5 (1-5)</td>
<td>4 (1)</td>
<td>4 (3)</td>
</tr>
<tr>
<td>31. (25)</td>
<td>Statistics that describe the frequency and severity of injuries in agricultural workplaces</td>
<td>3.51(2.55)</td>
<td>0.95 (1.29)</td>
<td>1-5 (1-5)</td>
<td>4 (1)</td>
<td>4 (2)</td>
</tr>
<tr>
<td>32. (27)</td>
<td>Safe procedures for operation of forklifts</td>
<td>3.42 (2.55)</td>
<td>1.15 (1.51)</td>
<td>1-5 (1-5)</td>
<td>4 (1)</td>
<td>4 (2)</td>
</tr>
<tr>
<td>33. (29)</td>
<td>Procedures for safely working on ladders or scaffolding at heights greater than 20 feet</td>
<td>3.39 (2.22)</td>
<td>1.28 (1.48)</td>
<td>1-5 (1-5)</td>
<td>4 (1)</td>
<td>4 (2)</td>
</tr>
<tr>
<td>34. (32)</td>
<td>Safe procedures for operation of earth moving equipment</td>
<td>3.38 (2.09)</td>
<td>1.24 (1.38)</td>
<td>1-5 (1-5)</td>
<td>4 (1)</td>
<td>4 (2)</td>
</tr>
</tbody>
</table>

(Table 3 continues)
Respondents ranked all competencies at least moderately important. Three competencies were perceived by current instructors of AgHOs certification programs as being of high importance \((M = 4.51-5.00)\): “effective communication with the intended audience,” “identification and explanation of the function and location of safety features and devices found on tractors,” and “basic operating principles of PTO powered agricultural machinery.”

The majority of competencies (75%) presented in the questionnaire were perceived by respondents as being of moderately high importance \((M = 3.51-4.50)\). This reflected that the competencies identified in the review of current resources continue to be important.

The remaining five competencies included in the questionnaire were perceived by respondents to be of moderate importance \((M = 2.51-3.50)\): “safe procedures for operation of forklifts,” “procedures for working on ladders or scaffolding at heights greater than 20 feet,” “safe procedures for operation of earth moving equipment,” “basic adolescent/youth development,” and “safe practices used when handling blasting agents.”

### Competencies Validation

Validation of instructor competencies was accomplished by the expert panel that allocated instructional time (in parentheses in Table 3) to each competency in a hypothetical AgHOs safety certification instructor curriculum. Data gathered from responses to the electronic survey of instructors resulted in a ranked order of competencies in terms of perceived importance. This ranked list of competencies was presented to expert panel members in order to provide a reference for use when allocating instructional time to each competency. Importance data was omitted in an attempt to avoid biasing the time allocation rankings (which also used a five-point Likert scale) of panel members.

The panel identified two competencies as requiring a large amount of time or emphasis \((M = 4.51-5.00)\), as noted by the data included in parentheses in Table 3. These two areas were: “identification and explanation of the function and location of safety features and devices found on tractors” \((M = 4.55, SD = 0.69)\) and “safe operation procedures relative to tractor component basics” \((M = 4.55, SD = 0.82)\).

The competency “safe practices used when handling blasting agents” \((M = 1.50, SD = 1.27)\) received the lowest mean ranking in terms of time or emphasis allocated to the subject by the expert panel. The panel reported that even though this activity is considered illegal under the provisions of the AgHOs, youth should be made aware of what tasks they cannot perform.

### Conclusions

#### Conclusions Concerning Questionnaire Response for Minimum Criteria

Criteria included in the questionnaire were isolated as a result of a review of literature related to past and current AgHOs curricula and available agricultural safety and health resources, input from a panel of experts, and results from a pilot survey of current instructors of the Gearing Up for Safety curriculum. The resulting 15 criteria were ranked in terms of level of importance by 249 current agricultural safety and health instructors via an electronic survey.
Age of the instructor, along with mastery of the primary language necessary for instruction, possession of a valid driver’s license, and completion of formal safety training were perceived of greatest importance. The instructors’ occupation appeared to be of lesser concern to questionnaire respondents. The criterion rated least important by respondents was that instructors obtain FEMA training and certification.

Conclusions Concerning Expert Panel Validation of Minimum Criteria

Validation of the criteria survey responses was conducted by an expert panel that determined the minimum mean “yes”/“no” score necessary to rate significance for the criteria. The minimum mean value was set at 0.50. Based on this determination, criteria numbers 1-7 listed in Table 2 were recommended for inclusion in future selection processes for AgHOs instructors.

Conclusions Concerning Questionnaire Response for Minimum Competencies

Based on a review of literature, applicable laws, related curricula, and feedback from experts in the field, a list of minimum core competencies necessary for mastery by instructors of AgHOs safety certification programs was generated and validated by a panel of experts as the recommended building blocks for instructor selection and training. The instructors’ ranking of the perceived level of importance of each competency guided the expert panel in determining the amount of time that should be allocated to each core competency.

Although the majority of competencies (86%) included in the questionnaire received rankings of at least moderately high importance, competencies that dealt directly with tractor and machinery safety were ranked among the highest by respondents. Examples included: “identification and explanation of the function and location of basic components found on powered agricultural machines,” “safe operation of powered agricultural machinery,” and “safe operation of a tractor through a structured course.” This appears to reflect both the historical focus of AgHOs training and the causes of the most severe injuries to youth employed in agriculture.

Conclusions Concerning Expert Panel Validation of Minimum Competencies

The distribution of time or emphasis for the competencies tended to resemble the importance rankings that were provided by electronic questionnaire respondents. Of the competencies included in the electronic questionnaire, “effectively communicate with the intended audience” was ranked by respondents as the most important. After discussion, the expert panel determined that this qualification was more in accordance with the definition of a criterion than a competency. In addition, experts found it to be redundant with respect to the criterion “mastery of the primary language necessary for instruction,” and therefore combined the two as a single criteria.

Many of the competencies ranked as requiring the greatest time allowance pertained to safe operation of agricultural tractors and machinery. Due to the fact that one of the primary purposes of AgHOs safety certification programs is to prepare youth ages 14-15 years old to safely operate agricultural tractors and machines for hire, the ranking was no surprise. Consequently, a strong emphasis of AgHOs safety certification instructor training should be placed on preparation of these individuals in tractor and machine safety, component identification, and operation knowledge.

Noteworthy is the moderately high level of emphasis placed on making instructors aware of their own and their students’ personal safety. This is supported by panel members’ ranking that “general awareness of agricultural hazards” and “proper use of personal protective equipment” should be allocated moderately large amounts of time or emphasis in an instructor curriculum.

Some competencies were associated with tasks that were expressly prohibited for youth in
the current AgHOs. These included items such as: “safe operation of farm vehicles with the primary purpose of carrying passengers,” “required procedures for entering confined spaces such as grain bins, silos, etc.,” and “safe practices used when handling blasting agents.” Initially, the panel of experts determined that these competencies were inappropriate for inclusion in an instructor curriculum since they are expressly identified as illegal for youth to perform under the age of 16. However, it was concluded that inclusion would result in an instructor possessing necessary knowledge of prohibited tasks. Thus, he or she could instruct youth of specific reasons why the tasks are hazardous and reiterate why youth should not perform them.

Discussion with the expert panel concluded that there would be insufficient time to address all potential ways that youth could be injured. Members recommended that the provisions of the AgHOs be revisited to initiate revisions that reflect newer curriculum material, current farm-related injury data, changes in agricultural practices and societal expectations, and findings of this study. Rather than responding to a small number of highly publicized agricultural-related injuries when proposing revisions to the current AgHOs, utilization of the criteria and competencies that have now been identified and validated would present a stronger, evidence-based framework for revisions.

Summary

The process used to identify and validate the minimum core criteria and competencies for instructors of certification programs under the provisions of the current AgHOs led to a list of specific outcomes for use in future curriculum development for instructors of AgHOs certification programs. Findings could be used to develop and pilot test targeted curricula that could be delivered via multiple formats, including face-to-face and online media. The process also provides a basis for assessing the readiness of potential instructors in an objective manner.

Most of the instructor criteria and competencies were consistent with general expectations reflected in currently used curricula, with several major exceptions. The low importance of being an Extension educator or agricultural (vocational) educator as a prerequisite indicated by respondents was surprising. This finding is inconsistent with the current requirements of the AgHOs, and may reflect expectations for persons in these positions that have changed dramatically over the past 40 years. Regardless, the findings suggest the restrictions should be re-evaluated in light of current skills and knowledge levels of these two groups.

One area of inconsistency between the surveyed AgHOs instructors and the expert panel was over the issue of testing and instructor certification. The current instructors reported that testing was of high importance; whereas the expert panel concluded that it was largely unneeded. This issue should be explored further. Regardless of current efforts to revise the AgHOs, the need to provide relevant instruction for those teaching agricultural safety and health competencies will remain. The greatest need for adequately prepared instructors will be for that population of youth who remain exempt from the current AgHOs provisions—the children of farm owners and operators. Any future consideration to the design of instructor training should include components that address reaching this underserved population.

Recommendations for Future Research

A greater understanding of the competencies and criteria most necessary for a successful agricultural safety education program could be from research efforts directed at employers of youth in agriculture. This population could provide a perspective of the jobs being assigned to youth, the dangers inherent to their operations, and the potential strategies to mitigate those risks.

An additional source of information that would better illustrate the balance between necessary competencies and criteria and those that would be best learned and utilized by students would be to seek feedback from youth who currently work in agriculture. These youth could identify the actual tasks being performed, the perceived need for instruction, and the characteristics of safety instructors that they believe to be of greatest importance in communicating safety and health information.
References


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Investigating the Effects of a Math-Enhanced Agricultural Teaching Methods Course

Christopher T. Stripling
University of Tennessee
T. Grady Roberts
University of Florida

Numerous calls have been made for agricultural education to support core academic subject matter including mathematics. Previous research has shown that the incorporation of mathematics content into a teaching methods course had a positive effect on preservice teachers’ mathematics content knowledge. The purpose of this study was to investigate the effects of a math-enhanced agricultural education teaching methods course on preservice agricultural education teachers’ mathematics ability, personal mathematics efficacy, mathematics teaching efficacy, and personal teaching efficacy. Results indicated that preservice teachers’ mathematics ability increased after the math-enhanced teaching methods course. Interestingly, personal mathematics efficacy decreased while mathematics teaching efficacy and personal teaching efficacy increased slightly after the math-enhanced teaching methods course. Based on the results of this study, peer-teaching that utilizes the seven components of a math-enhanced lesson may be an appropriate means to improve the mathematics ability of preservice agricultural education teachers.

Keywords: mathematics; math; preservice teachers; self-efficacy; teaching methods; teacher education

Increasing the mathematics proficiency of American students continues to be a top priority (National Commission on Mathematics and Science Teaching for the 21st century, 2000; National Research Council, 2001, 2007, 2011) almost thirty years after the National Commission of Excellence in Education (1983) released A Nation at Risk: The Imperative for Educational Reform. The National Commission of Excellence in Education called for additional instructional time, an increase in graduation rates, higher academic standards, and better-quality teacher education programs (Vinovskis, 2009). However, a plethora of recent research has shown that U.S. students are not proficient in mathematics (National Center for Educational Statistics, 2000a, 2000b, 2004, 2009a, 2009b, 2010, 2011). Likewise, the lack of mathematics proficiency among Florida students is well recognized, and in 2010, 56% of Florida 10th graders experienced little to partial success in mathematics (Florida Department of Education, 2010). In addition, the Michigan State University Center for Research in Mathematics and Science Education (2010) stated that preservice teachers are ill-prepared to teach a rigorous mathematics curriculum and that teacher education should provide training in mathematics and the methods of teaching mathematics. Therefore, the Michigan State University Center for Research in Mathematics and Science Education (2010) called for the U.S. educational system to “break the vicious cycle in which we find ourselves” (p. 3), where elementary and secondary teachers that are not proficient in mathematics produce students that are not proficient in mathematics, who then become teachers themselves and lack the necessary content knowledge to effectively teach mathematics. Consistent with the Michigan State University Center for Research in Mathematics and Science Education, Stripling and Roberts (2012a) found that Florida preservice agricultural education teachers were not proficient in mathematics standards within the agricultural curricula and are therefore ill-prepared to teach mathematics found naturally within the secondary agricultural education curricula.

Based on the aforementioned findings and recommendations, this study will seek to improve the mathematics ability of Florida preservice agricultural education teachers by incorporat-
Incorporating the seven components of a math enhanced lesson (Stone, Alfeld, Pearson, Lewis, & Jensen, 2006) into the agricultural education teaching methods course at the University of Florida. In addition, this study will investigate the effects that a math-enhanced agricultural education teaching methods (MEAETM) course will have on personal mathematics efficacy, mathematics teaching efficacy, and personal teaching efficacy. Moreover, this study will contribute to priority 3 (sufficient scientific and professional workforce that addresses the challenges of the 21st century) and priority 5 (efficient and effective agricultural education programs) of the American Association for Agricultural Education’s national research agenda (Doerfert, 2011).

Theoretical Framework/Literature Review

The theoretical framework for this study was Bandura’s (1986) social cognitive theory. According to Bandura, social cognitive theory explains cognitive changes or learning over a lifetime and emphasizes that most cognitive skills are socially cultivated. In addition, Bandura purported that human thought and behavior are influenced by direct and observational experiences and physiological factors. Therefore, human behavior is influenced by personal experiences and are “retained in neural codes, rather than being provided ready-made by inborn programming” (Bandura, 1986, p. 22). With that in mind, “social cognitive theory encompasses a large set of factors that operate as regulators and motivators of established cognitive, social, and behavioral skills” (Bandura, 1997, p. 35). Thus, people are neither driven by inner forces nor automatically shaped and controlled by external stimuli. Rather, human functioning is explained in terms of a model of triadic reciprocity in which behavior, cognitive and other personal factors, and environmental events all operate as interacting determinants of each other. (Bandura, 1986, p. 18) Bandura also stated that the interacting determinants (behavior, internal personal factors, and the external environment) influence each other bidirectionally, but their influences are not equal. Operationalized for this study, behavior is the teaching of contextualized mathematics, external environment is the teacher education program, and personal factors are self-efficacy and mathematics ability (Figure 1).

![Triadic reciprocity model](image)

*Figure 1. Triadic reciprocity model. Adapted from Bandura (1986).*
Behavior – Teaching Contextualized Mathematics

In the context of this study, teaching contextualized mathematics in the teaching methods course is considered a behavior that is influenced bidirectionally by personal and environmental determinants. For example, teaching agriculture was influenced by the National Research Council’s (1988) call to emphasize academic skills through an integrated curricula and to become more than a vocational discipline, which influenced agricultural instruction in secondary and postsecondary settings (Phipps, Osborne, Dyer, & Ball, 2008). Previous research has indicated that preservice teachers are ill-prepared and lack sufficient mathematics content knowledge to teach mathematical concepts (Frykholm, 2000; Fuller, 1996; Goulding, Rowland, & Barber, 2002; Michigan State University Center for Research in Mathematics and Science Education, 2010; Miller & Gliem, 1996; Stacey, Helme, Steinle, Baturo, Irwin, & Bana, 2001; Stoddart, Connell, Stofflett, & Peck, 1993; Stripling & Roberts, 2012a, 2012b; Wilburne & Long, 2010), thus theoretically impacting the behavior of teaching mathematics.

Parnell (1996) claimed that “the basis for good teaching is combining an information rich subject matter content with an experience rich context of application” (p. 1), and Prescott, Rinar, Cockerill, and Baker (1996) purported that academic and vocational subjects should be integrated to maximize learning opportunities. With this in mind, Stone et al. (2006) experimentally investigated the Math-in-CTE model, which was developed as a means for enhancing mathematics instruction in Career and Technical Education (CTE). The study consisted of 236 CTE teachers, 104 mathematics teachers, and 3,950 secondary students. At the core of the model was a partnership formed between CTE and mathematics teachers in which the mathematics teachers aided the CTE teachers in developing math-enhanced lessons and were available for support before and after the lessons. As a result of instruction in secondary schools that utilized the math-enhanced lessons, the researchers discovered that technical skill acquisition was not diminished and that the CTE students’ mathematics content knowledge increased. Congruently, research in the field of agricultural education has supported the effectiveness of math-enhanced curricula that utilizes the seven elements of a math-enhanced lesson as a model for teaching contextualized mathematics (Parr, Edwards, & Leising, 2006, 2008; Young, Edwards, & Leising, 2009).

Personal Factors

In social cognitive theory, personal factors influence the external environment and behavior (Bandura, 1986). More specifically, in the context of this study, a preservice teacher’s self-efficacy and mathematics ability are personal factors that affect the behavior of teaching mathematics and the environment of the teacher education program. Correspondingly, the National Council of Teachers of Mathematics (NCTM; as cited in Benken & Brown, 2008) posited that teachers of mathematics should have an “integrated, connected view of mathematics, rather than a procedural, rule-based view” (p. 1). Similarly, Darling-Hammond and Bransford (2005) described three types of knowledge that are required for effective teaching: (a) subject matter knowledge, (b) pedagogical knowledge, and (c) pedagogical content knowledge. In the context of this study, mathematics ability and personal mathematics efficacy are measures of subject matter knowledge, personal teaching efficacy is a measure of pedagogical knowledge, and personal mathematics efficacy is a measure of pedagogical content knowledge.

Self-efficacy

Self-efficacy is one example of a personal factor that according to Bandura (1997) “occupies a pivotal role...because it acts upon the other classes of determinants” (p. 35). More explicitly, self-efficacy influences the activities one selects, motivation, knowledge acquisition, analytical thinking, and one’s talents (Bandura, 1986). Self-efficacy is defined as one’s judgment about one’s ability to perform a behavior or task (Bandura, 1997). Thus, a student’s self-efficacy regulates their learning and impacts their academic accomplishments (Bandura, 1993). Furthermore, teacher or teaching efficacy is a more specific type of self-efficacy (Strip-
ling, Ricketts, Roberts, & Harlin, 2008), and is a teacher’s belief in his/her capability to facilitate the learning environment and produce desired learning outcomes (Guskey & Passaro, 1994; Soodak & Podell, 1996). Teachers who are more efficacious persevere through challenges in the learning environment (Goddard, Hoy, & Woolfolk Hoy, 2004) and put forth more effort in designing learning activities (Allinder, 1994).

Previous research with preservice teachers found that teacher education programs should scaffold teaching experiences, thus reducing instances where preservice teachers lower their self-perceptions of what constitutes excellent teaching (Tschannen-Moran, Hoy, & Hoy K., 1998). In developing teacher efficacy, teacher education programs should provide opportunities for preservice teachers to state personal beliefs related to teaching and learning and then expand and integrate new knowledge into existing beliefs (Kagan, 1992). Specific to agricultural education, Knobloch (2001) discovered that peer-teaching increased preservice teacher’s teaching efficacy, and student teaching has been shown to have a positive effect on teaching efficacy (Harlin, Roberts, Briers, Mowen, & Edgar, 2007; Roberts, Harlin, & Ricketts, 2006; Roberts, Harlin, & Briers, 2008; Stripling et al., 2008). What is more, Roberts, Mowen, Edgar, Harlin, and Briers (2007) found that teaching efficacy was negligibly related to personality type, and Roberts et al. reported that placing two agricultural education preservice teachers at one internship site did not significantly affect teaching efficacy.

**Mathematics ability**

A plethora of research exists that underscores the mathematics deficiency among the nation’s preservice teachers (Adams, 1998; Ball & Wilson, 1990; Bryan, 1999; Even, 1990, 1993; Frykholm, 2000; Goulding et al., 2002; Matthews & Seaman, 2007; Michigan State University Center for Research in Mathematics and Science Education, 2010; Miller & Gliem, 1996; Stacey et al., 2001; Stoddart et al., 1993; Stripling & Roberts, 2012a, 2012b; Wilburme & Long, 2010). Correspondingly, research conducted with agricultural education preservice teachers has also revealed mathematical deficiencies (Miller & Gliem, 1996; Stripling & Roberts, 2012a, 2012b). To that end, Miller and Gliem (1996) found that preservice teachers at The Ohio State University scored 37.1% on an instrument used to measure agricultural mathematics problem solving ability. Likewise, Stripling and Roberts (2012a) reported that preservice teachers at the University of Florida averaged 35.6% on a mathematics assessment that was based on the national secondary agricultural education standards. Using the same assessment as Stripling and Roberts (2012a), Stripling and Roberts (2012b) reported that a randomly selected sample of preservice teachers from U.S. agricultural teacher education programs revealed that the nations’ preservice agricultural education teachers are not proficient in mathematics, and the population mean on the mathematics assessment was estimated to be between 28.5% and 48.5% with 95% confidence. Lastly, research in agricultural education has shown that an agricultural education teacher’s mathematics ability is significantly associated with their students’ mathematics ability (Persinger & Gliem, 1987).

**External Environment – Teacher Education Program**

According to Bandura (1986), the external environment is influenced by behavior and internal personal factors. For this study, the external environment is the agricultural teacher education program at the University of Florida. Considerable disagreement and debate surround the purpose of teacher education (Hansen, 2008); nevertheless, Myers and Dyer (2004) stated that the “goal of preservice teacher education is to make the most effective use of the time available to prepare future educators for the task awaiting them” (p. 47). In regard to teaching mathematics, teacher education programs should aid preservice teachers in fostering positive philosophies and attitudes about teaching and learning mathematics (Charalambous, Panouora, & Philippou, 2009). To that end, teacher education programs have been shown to influence how beginning teachers dialogue about teaching and learning mathematics (Ensor, 2001) and that research-proven mathematics instructional practices incorporated into a teacher education pro-
gram positively affect student achievement (Berry, 2005). Burton, Daane, and Gieson (2008) further found that adding 20 minutes of mathematics content instruction into a teaching methods course positively affected mathematics content knowledge of preservice teachers. Research has also discovered that mathematics content knowledge was improved when preservice teachers experience content, teaching methods, and field experiences concurrently (Wilcox, Schram, Lappan & Lanier, 1991). Specific to agricultural teacher education, The National Standards for Teacher Education in Agriculture (American Association for Agricultural Education, 2001) suggested that general education should comprise one-third of the agricultural education program hours and should develop theoretical and practical understandings. Mathematics was specifically mentioned as an expectation of coursework within general education, yet recommendations for mathematics instruction and content knowledge were not given. Swortzel (1995) recommended that calculus and statistics/data analysis should be required, and this recommendation is supported by research that has found a substantial association between advanced mathematics or calculus and mathematics ability (Stripling & Roberts, 2012b). However, Swortzel’s article was the only reference found that recommended specific mathematics coursework for agricultural teacher education. Also, consistent with the disagreement mentioned above, variability exists in agricultural teacher education programs (McLean & Camp, 2000; Swortzel, 1999). For example, Swortzel (1999) reported that U.S. agricultural education programs were found in colleges of agriculture, education, and business or technology and credit hours for a four year degree ranged from 120-148. Moreover, McLean and Camp (2000) reported that the top 10 peer nominated agriculture teacher education programs had substantial variations in their required coursework or programs of studies. For example, McLean and Camp discovered 118 different topics were being taught with only 44 of the topics being taught in at least 50% of the programs.

Purpose

The purpose of this study was to investigate the effects of a MEAETM course on preservice agricultural education teachers’ mathematics ability, personal mathematics efficacy, mathematics teaching efficacy, and personal teaching efficacy.

Four null hypotheses were used to guide this inquiry:

$H_{01}$: There is no significant difference in the mathematics ability of preservice agricultural education teachers before and after the MEAETM treatment.

$H_{02}$: There is no significant difference in the personal mathematics efficacy of preservice agricultural education teachers before and after the MEAETM treatment.

$H_{03}$: There is no significant difference in the mathematics teaching efficacy of preservice agricultural education teachers before and after the MEAETM treatment.

$H_{04}$: There is no significant difference in the personal teaching efficacy of preservice agricultural education teachers before and after the MEAETM treatment.

Methodology

Definition of Terms

The following terms were operationally defined for this study:

- The teaching method course was operationally defined as a teaching and learning methods course that “focuses on the selection and use of teaching strategies, methods/approaches, and techniques; evaluating learning; and managing learning environments for teaching agricultural subjects in formal educational settings” (Roberts, 2009, p. 1).

- Mathematics ability is defined as the students’ scores on the Mathematics Ability Test (Stripling & Roberts, 2012a).

- Personal mathematics efficacy is the self-belief in one’s capabilities to solve mathematics problems. Personal mathematics efficacy was defined as the student’s score on 8 items contained in the Mathematics En-
Mathematics teaching efficacy is a person’s self-belief about their capabilities to teach mathematics. Mathematics teaching efficacy was defined as the student’s score on 13 items contained in the *Mathematics Enhancement Teaching Efficacy Instrument* by Jansen (2007).

Personal teaching efficacy is a person’s self-belief about their capabilities to teach. Personal teaching efficacy was defined as the student’s score on 12 items contained in the *Mathematics Enhancement Teaching Efficacy Instrument* by Jansen (2007).

### Research Design

This study was preexperimental and utilized a one-group pretest-posttest design (Campbell & Stanley, 1963). The research design is shown below:

\[ O_1 \times O_2 \]

Threats to internal validity are history, maturation, testing, instrumentation, and possibly statistical regression (Campbell & Stanley, 1963). History is a limitation of this study, however, it should be noted that no participants were enrolled in a mathematics course during this study. Maturation and testing are also noted as limitations of this study; however, to reduce the influence of testing the posttests were given at the beginning of the 2011 semester instead of the end of the 2010 semester. Instrumentation was controlled by using a scoring rubric that was made by two secondary mathematics experts and by utilizing one scorer. Lastly, statistical regression is only a threat if subjects are selected based on extreme scores (Campbell & Stanley, 1963).

In this study, the participants were not selected because of extreme scores.

### Sample

The target population for this study was preservice agriculture teachers in their final year of a teacher education program at the University of Florida’s main campus. For this study, the sample was a purposive convenience sample that was conceptualized as a slice in time (Oliver & Hinkle, 1981), and according to Gall, Borg, and Gall (1996), when convenience sampling is used the researcher should provide a comprehensive description of the sample and describe the reasons for selection. To that end, the sample was selected based on previous research, which discovered that Florida preservice agricultural education teachers were not proficient in the mathematics content of the cross-referenced NCTM sub-standards (Stripling & Roberts, 2012a). The sample consisted of 22 preservice agricultural education teachers, 17 females and 5 males, that volunteered to participate and signed an informed consent that was approved by the University of Florida’s Institutional Review Board. The small sample size is a limitation of this study. The participants’ average age was 22 years old (SD = 1.41), and 21 of the participants described their ethnicity as white and one as other. Twenty of the participants were completing an undergraduate degree, and the remaining two participants were completing a graduate degree. The mean university grade point average was 3.53 (SD = 0.46).

### Instrumentation

The participants agreed to complete the *Mathematics Ability Test* (Stripling & Roberts, 2012a) and the *Mathematics Enhancement Teaching Efficacy Instrument* (Jansen, 2007). The *Mathematics Ability Test* consist of 26 open-ended mathematical word problems and was utilized because it was developed based on the previously mentioned 13 NCTM sub-standard that are cross-referenced with the National Agriculture, Food and Natural Resources Career Cluster Content Standards (National Council for Agricultural Education, 2009). The instrument took approximately 60 minutes to complete and the reliability or the Cronbach’s alpha coefficient was reported by Stripling and Roberts (2012a) to be .80. Additionally, the researchers stated that a panel of experts comprised of two secondary mathematics experts and university agricultural teacher education and mathematics faculty representing three universities established face and content validity. The 26 open-ended mathematical word problems of the *Mathematics Ability Test* were scored as in-
correct, partially correct, or correct using a rubric that, according to Stripling and Roberts, was developed by two secondary mathematics experts. The Mathematics Enhancement Teaching Efficacy Instrument was developed and validated during a doctoral dissertation at Oregon State University and is divided into three constructs: (a) personal mathematics efficacy, (b) mathematics teaching efficacy, and (c) personal teaching efficacy. The instrument utilizes a different rating scale for each construct – personal mathematics efficacy (1 = not at all confident to 4 = very confident), mathematics teaching efficacy (1 = strongly disagree to 5 = strongly agree), and personal teaching efficacy (1 = nothing to 9 = a great deal of influence; Jansen, 2007). Jansen (2007) reported that face and content validity were established by a panel of experts and that the Cronbach’s alpha coefficients for the personal mathematics efficacy, mathematics teaching efficacy, and personal teaching efficacy constructs to be .84, .88, and .91, respectively. Scores for each construct were calculated by averaging the corresponding items after reverse coding items 2, 4, 5, 7, 9, 10, 11, and 13. The Mathematics Enhancement Teaching Efficacy Instrument took 8-12 minutes to complete.

Furthermore, each instrument was administered before and after the treatment utilized in this study. More specifically, the Mathematics Ability Test was administered the second week of the Fall 2010 semester and the first week of the Spring 2011 semester. The Mathematics Enhancement Teaching Efficacy Instrument was administered week three of the Fall 2010 and Spring 2011 semesters. Since the instruments were administered during instructional time, the preservice teachers were informed that volunteering to complete the instruments would not positively or negatively affect their course grade.

### Treatment – MEAETM

The treatment for this study was devised by the researchers and was incorporated into the Fall 2010 agricultural education teaching methods course at the University of Florida as a potential means to improve the mathematics ability of the preservice teachers enrolled in the course. The treatment consisted of three parts. First, the researcher prepared and delivered a lecture to the preservice teachers that explained and demonstrated how to use the National Research Center for Career and Technical Education’s seven components of a math-enhanced lesson (Stone et al., 2006) to teach mathematical concepts in the context of agriculture (Figure 2). Second, each preservice teacher was randomly assigned two of the thirteen NCTM sub-standards that have been cross-referenced to the National Agriculture, Food and Natural Resources Career Cluster Content Standards.

Third, the preservice teachers were required to teach the two NCTM sub-standards to their peers using the seven components of a math-enhanced lesson (Stone et al., 2006). Therefore, each preservice teacher participated in the math-enhanced lesson lecture, integrated mathematics content that corresponds to their randomly assigned NCTM sub-standards into two of the normally required peer-teaching lessons of the teaching methods course, and participated in each other’s math-enhanced peer-teaching lessons. In summary, beyond what was previously required in the teaching methods course at the University of Florida the treatment added the following three elements: (a) a lecture on the seven components of a math-enhanced lesson, (b) random assignment of the NCTM sub-standards among the preservice teachers, and (c) requiring two of the peer-teaching lessons to be math-enhanced.
Data Analysis

Demographic and mathematics background data were summarized using descriptive statistics. Paired samples t tests were utilized to determine if a significant difference existed in mathematics ability, personal mathematics efficacy, mathematics teaching efficacy, and personal teaching efficacy scores from before to after the MEAETM treatment, and according to Agresti and Finlay (1997), t tests are appropriate for small sample sizes. In addition, Dunlap, Cortina, Vaslow, and Burke's (1996) formula for calculating effect size was also used to correct for overestimation due to the correlation between measures.

Findings

Mathematics Ability

The pretest results revealed that 19 (86.4%) of the preservice teachers answered fewer than 50% of the items correctly on the mathematics ability instrument (Table 1). The mean score was 34.4% or 8.93 (SD = 3.78) on the 26 item instrument, and the scores ranged from 9.6% to 63.5%. The posttest results revealed that 63.6% of the preservice teachers answered fewer than 50% of the items correctly, and the mean score was 46.5% or 12.09 (SD = 4.25). The posttest scores ranged from 23.1% to 86.5%.

Table 1
Analysis of Scores on the Mathematics Ability Test

<table>
<thead>
<tr>
<th>Number correct (out of 26) range</th>
<th>% of students</th>
<th>f</th>
<th>% correct range</th>
<th>Pretest</th>
<th>Posttest</th>
<th>Pretest</th>
<th>Posttest</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.5 – 5.5</td>
<td>9.6 – 21.2</td>
<td>5</td>
<td>0</td>
<td>22.7</td>
<td>0.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.0 – 9.0</td>
<td>23.1 – 34.6</td>
<td>8</td>
<td>6</td>
<td>36.3</td>
<td>27.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.5 – 12.5</td>
<td>36.5 – 48.1</td>
<td>6</td>
<td>8</td>
<td>27.3</td>
<td>36.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13.0 – 16.5</td>
<td>50.0 – 63.5</td>
<td>3</td>
<td>6</td>
<td>13.6</td>
<td>27.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>21.5 – 22.5</td>
<td>82.7 – 86.5</td>
<td>0</td>
<td>2</td>
<td>0.0</td>
<td>9.1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. Pretest mean score 8.93 (SD = 3.78); posttest mean score 12.09 (SD = 4.25), out of 26 possible.

In addition, an analysis of hypothesis one revealed a 12.15% increase in scores after the MEAETM treatment (Table 2), and the increase in mathematics ability scores after the treatment was significantly different (p = .00). Thus, the null hypothesis was rejected. The practical significance of the difference was assessed using Cohen’s d, and the effect size was .78, which is a medium effect size according to Cohen (as cited in Kotrlik, Williams, & Jabor, 2011).
Table 2
Summary of Paired Samples t test

<table>
<thead>
<tr>
<th></th>
<th>Mean difference</th>
<th>SD</th>
<th>SE</th>
<th>t</th>
<th>p</th>
<th>d</th>
</tr>
</thead>
<tbody>
<tr>
<td>Math ability posttest – pretest</td>
<td>12.15</td>
<td>10.97</td>
<td>2.34</td>
<td>5.19</td>
<td>.00</td>
<td>.78</td>
</tr>
</tbody>
</table>

**Mathematics Enhancement Teaching Efficacy**

As depicted in Table 3, pretest results indicated that the preservice teachers in this study were confident in their mathematics ability (personal mathematics efficacy, \( M = 3.46, SD = .39 \)), moderately efficacious in their ability to teach mathematics (mathematics teaching efficacy, \( M = 3.37, SD = .71 \)), and perceived themselves as having “Quite a Bit of Influence” in affecting student learning (personal teaching efficacy, \( M = 7.25, SD = .72 \)). Posttest results revealed that the preservice teachers were confident in their mathematics ability (personal mathematics efficacy, \( M = 3.35, SD = .65 \)), moderately efficacious in their ability to teach mathematics (mathematics teaching efficacy, \( M = 3.45, SD = .60 \)), and perceived themselves as having “Quite a Bit of Influence” in affecting student learning (personal teaching efficacy, \( M = 7.34, SD = .80 \)).

Table 3
Mathematics Enhancement Teaching Efficacy Scores

<table>
<thead>
<tr>
<th></th>
<th>Personal Mathematics Efficacy (PME)</th>
<th>Mathematics Teaching Efficacy (MTE)</th>
<th>Personal Teaching Efficacy (PTE)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>( M )</td>
<td>SD</td>
<td>( M )</td>
</tr>
<tr>
<td>Pretest</td>
<td>3.46</td>
<td>.39</td>
<td>3.37</td>
</tr>
<tr>
<td>Posttest</td>
<td>3.35</td>
<td>.65</td>
<td>3.45</td>
</tr>
</tbody>
</table>

*Note. Scales: personal mathematics efficacy (1 = not at all confident to 4 = very confident), mathematics teaching efficacy (1 = strongly disagree to 5 = strongly agree), and personal teaching efficacy (1 = nothing to 9 = a great deal of influence; Jansen, 2007).*

Furthermore, analysis of hypotheses two, three, and four revealed a .11 point decrease on a 4-point scale in personal mathematics efficacy, a .09 point increase on a 5-point scale in mathematics teaching efficacy, and a .09 point increase on a 9-point scale in personal teaching efficacy after the MEAETM treatment (Table 4). However, the mean differences were not statistically significant. Thus, the null hypotheses were not rejected.

Table 4
Summary of Paired Samples t tests – Self-Efficacy

<table>
<thead>
<tr>
<th></th>
<th>Mean difference</th>
<th>SD</th>
<th>SE</th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>PME posttest – pretest</td>
<td>-.11</td>
<td>.52</td>
<td>.11</td>
<td>1.00</td>
<td>.33</td>
</tr>
<tr>
<td>MTE posttest – pretest</td>
<td>.09</td>
<td>.90</td>
<td>.20</td>
<td>.45</td>
<td>.66</td>
</tr>
<tr>
<td>PTE posttest – pretest</td>
<td>.09</td>
<td>1.06</td>
<td>.23</td>
<td>.37</td>
<td>.72</td>
</tr>
</tbody>
</table>

**Conclusions/Implications/Recommendations**

The MEAETM treatment had a positive effect on the preservice agricultural education teachers’ mathematics ability scores, and the practical significance of the difference in the scores was described as medium (\( d = .78 \)). Consistent with Burton et al. (2008), the incorporation of mathematics into a teaching methods course may significantly increase the mathematics ability of preservice teachers. The results of this study were also consistent with Pascarella and Terenzini (2005), which stated that peer interaction that reinforce academics “appear to influence positively knowledge acquisition and academic skill development during college” (p.
Furthermore, these results support Bandura’s (1986) social cognitive theory, and the belief that cognitive skills can be socially cultivated. With that in mind, this study suggests that peer-teaching that utilizes the seven components of a math-enhanced lesson (Stone et al., 2006) may be an appropriate means to improve the mathematics ability of preservice agricultural education teachers. Therefore, the authors recommend that the MEAETM treatment be incorporated into the agricultural education teaching methods course at the University of Florida. Due to the limited scope of this study, future research should further investigate the effects of mathematics peer-teaching on preservice teachers’ mathematics ability.

Furthermore, the preservice teachers were confident in their personal mathematics efficacy before and after the MEAETM treatment. This is very interesting since the self-efficacy data was collected after the administrations of the mathematics ability instrument and despite a mean pretest ability average of 34.4% and a mean posttest average of 46.5%. Theoretically, Bandura’s (1986) social cognitive theory would suggest that confidence in personal mathematics efficacy should positively influence the behavior of teaching mathematics found naturally in the secondary agricultural curricula. On the other hand, Bandura’s social cognitive theory would also suggest that low mathematics ability should negatively influence the behavior of teaching mathematics in the secondary agricultural curricula. Thus, future research should seek to explain this disconnect between personal mathematics efficacy and mathematics ability among the preservice teachers. With that in mind, it is conceivable that even after the treatment of this study that the preservice teachers are ill-informed of the level of mathematics present in the secondary agricultural education standards. Therefore, future research should examine preservice teachers’ perceptions of the mathematics found naturally in the secondary agricultural curricula. Additionally, research should inquire into the development of personal mathematics efficacy and investigate factors that influence personal mathematics efficacy among preservice agricultural teachers. The aforesaid research is vital, since personal mathematics efficacy is a preservice teacher’s perception of their mathematics content knowledge, which Darling-Hammond and Bransford (2005) would call subject matter knowledge. Subject matter knowledge is an essential type of knowledge for effective teaching (Darling-Hammond & Bransford, 2005).

What is more, the preservice teachers were moderately efficacious in mathematics teaching efficacy and efficacious in personal teaching efficacy before and after the treatment. This fact is encouraging because mathematics teaching efficacy is a measure of the preservice teachers’ perceptions of their ability to teach mathematics, and personal teaching efficacy is a measure of the preservice teachers’ perceptions of their ability to teach in general. However, why are preservice teachers moderately efficacious in teaching mathematics when they are not proficient in mathematics after the treatment of this study? Future research should examine this issue. Additionally, research should seek to determine if the MEAETM treatment has an impact on the teaching of mathematics content in secondary agricultural classes once the preservice teachers graduate. Also, are the preservice teachers more likely to successfully integrate mathematics after graduation as a result of the MEAETM treatment, and do the preservice teachers with the highest mathematics ability scores produce students with higher scores like the secondary agriculture teachers in Persinger and Gliem (1987)?

Furthermore, the authors recommend that additional empirical research be conducted to validate the effectiveness of the MEAETM treatment in other preservice agricultural teacher populations. The authors also recommend that a quasi-experimental research design be utilized to further examine the effectiveness of the MEAETM treatment. Moreover, future research should determine if mathematics can be effectively and efficiently integrated into other agricultural teacher education courses. To that end, it is plausible, that the summative effect of small changes made to agricultural teacher education coursework, which emphasizes mathematics integration may produce preservice agricultural education teachers that are proficient in mathematics and aid the agricultural education profession in answering the numerous calls to assist in improving secondary students’ mathematics achievement. However, agricultural teacher ed-
ucators must be willing to integrate mathematics into agricultural teacher education coursework and be willing to provide assistance when pre-service teachers encounter mathematical difficulties or be able to suggest sources of support and remediation.

References


CHRISTOPHER T. STRIPLING is an Assistant Professor in the Department of Agricultural Leadership, Education and Communications at the University of Tennessee, 320B Morgan Hall, 2621 Morgan Circle, Knoxville, TN 37996-4511, cstripling@utk.edu

T. GRADY ROBERTS is an Associate Professor of Agricultural Education in the Department of Agricultural Education and Communication at the University of Florida, PO Box 110540, Gainesville, FL 332611, groberts@ufl.edu
The Effect of Human Capital on Principals’ Decisions to Interview Candidates in Agricultural Education: Implications for Pre-service Teachers

J. Shane Robinson  
Oklahoma State University  
Marshall A. Baker  
Lincoln Academy, Stillwater, OK

The purpose of this experimental study was to determine which factors of human capital were valued most by principals regarding their decisions to interview candidates, based on teacher resumes. The findings of this study point to the fact that principals desire teachers who are academically rigorous. That is, they desire teachers who have strong grade point averages, have been recognized in honor societies for their academics, and have taken elevated, rigorous coursework above and beyond what a typical agricultural education major would be required to take. The sex and certification route of teacher candidates had no bearing on principals’ decision to offer an interview to the candidates. The fact that principals placed little value on certification type is concerning. It is recommended that this study be replicated in other states across the country to determine the prototypical agriculture teacher. It is assumed that the needs will vary from state to state. However, additional research is needed in this area.

Keywords: human capital, teacher candidates, principals’ perceptions

“One of the most important roles a building administrator plays is recommending the employment of teachers to the superintendent of schools” (Sulaver, 2008, p. 58). Unfortunately, principals do not always hire the best, most qualified candidates (Ballou, 1996; Wise, Darling-Hammond, & Berry, 1987). Sometimes principals make bad hiring decisions due to their own personal bias. Other times they miss out on possible, effective teachers due to the system’s red tape (Wise et al., 1987). Regarding personal bias, principals can and do make biased decisions on the hiring process of teachers. In fact, principals tend to select teachers who have similar academic backgrounds as their own (Baker & Cooper, 2005). Unbiased factors contributing to not hiring the best candidate include a lack of strong recruitment strategies, cumbersome and ineffective screening processes, and lengthy decision processes (Wise et al., 1987). Goldhaber and Brewer (2000) opined “it may be the case that states do not have a significant effect on the quality of teachers in the classroom because they are actually doing little to screen out poor candidates” (p. 131). Therefore, principals should make efforts to tighten their requirements and screenings to obtain the best, most qualified, and effective teachers possible (Wise et al., 1987).

Determining what constitutes a quality teacher is somewhat contradicting (Baker & Cooper, 2005) and challenging to define (Feistritzer & Haar, 2008). The dilemma of whether or not teachers should experience teacher preparation programs has been ongoing. Mixed results exist as to whether effective teachers are those who have learned pedagogy in teacher preparation programs or who have learned content-specific knowledge in undergraduate programs (Wilson & Floden, 2003). According to the report, What Matters Most: Teaching for America’s Future, published by the National Commission on Teaching and America’s Future (NCTAF) (1996), quality teachers are those who are astute at pedagogy. However, a study by Goldhaber and Brewer (2000) found that no statistically significant difference existed in student performance regarding those who
were taught by teachers trained in pedagogy versus those who were not. Wayne and Youngs (2003) found that students who had a traditionally certified mathematics teacher statistically outperformed those students who had a mathematics teacher who was alternatively certified. Yet, when comparing other disciplines, no difference in students’ test scores was found.

Roberts and Dyer (2004a) conducted a study to determine what characteristics embodied an effective agriculture teacher. They found that to be effective, agricultural educators should be proficient at advising the local FFA program, supervising supervised agricultural experiences, building community relations, marketing the local program to community patrons, exhibiting professionalism, planning and managing the total program, and being a quality person. Although, agriculture teachers who are alternatively certified believe they are sound in implementing effective pedagogy (Duncan & Rick- etts, 2008; Roberts & Dyer, 2004b; Robinson, Krysher, Haynes, & Edwards, 2010; Rocca & Washburn, 2006), Robinson et al. (2010) found that there was a statistically significant difference regarding student achievement indicators in favor of traditionally certified teachers when comparing them with their alternatively certified counterparts. Regardless of certification type, pedagogical experiences such as lesson planning, lifelong learning, curriculum design, assessment strategies, professionalism, and classroom management are crucial skills for entry-level teachers to possess (Rosenfeld, Reynolds, & Bakatko, 1992; Rosenfeld & Tannenbaum, 1991).

Retaining quality teachers has been a major issue in education for years (Hess, 2000; Ruhland & Bremer, 2002). Because of the lack of certified teachers, the demand for teacher quality continues to escalate (Feistritzer & Haar, 2008; Good, McCaslin, Tsang, Zhang, Wiley, Bozack, & Hester, 2006). As such, ensuring that today’s school children are equipped with quality teachers is an imperative task (Goldhaber & Brewer, 2000). Because principals can set the precedence for the school’s culture by the type of teachers they hire (Baker & Cooper, 2005), it is important to determine which factors appeal to them most when screening applications.

In a literature review to determine which factors appeal most to principals when making hiring decisions regarding potential teachers, it was found that, typically, female principals place greater emphasis on learning about the potential teachers’ background and experiences than do their male counterparts (Sulaver, 2008). These areas of emphasis include the “candidate’s dedication to the profession, ability to build relationships, knowledge of teaching and learning, and information received from reference calls” (p. 48).

Experience and knowledge appear to play a vital role in a candidate’s success at advancing through the screening committee and landing an interview (Sulaver, 2008), as they are strong predictors of student achievement (Wayne & Youngs, 2003). However, a teacher’s knowledge should not be misconstrued to indicate grade point average (GPA). In fact, in a study of female and male principals, they both had the least amount of value regarding candidates’ honors and awards listed on their application, and as such, tended to devalue a candidate’s GPA as well (Sulaver, 2008). Therefore, being strong academically does not always lead to employment for aspiring teachers (Ballou, 1996; Weeks, 2006). Ballou (1996) noted that some principals have little regard for teachers’ with strong academic backgrounds. Rather, they desire individuals who can build relationships with students and teach them to think.

Understanding the perceptions of the principal regarding the agriculture program and its teacher is important because the “principal’s perceptions influence whether or not an agricultural education program exists” (Smith & Myers, 2012, p. 160). To determine which criteria were most important to administrators who employ high school agriculture teachers in Oklahoma, Cantrell and Weeks (2004) found that agricultural subject knowledge was preferred most. Administrators desired teachers who were well rounded in the program with experiences in classroom and laboratory instruction, FFA, and SAE. However, they had little regard for teachers’ general education knowledge. In a similar study, Weeks (2006) found that administrators preferred candidates who expressed an enthusiastic attitude to teach and could develop positive relationships within the community.
The criteria valued least by administrators were teachers’ experiences in production agriculture, involvement in activities while in college, and GPA.

Given the opportunity to compare, do principals prefer candidates with teacher preparation credentials (traditionally certified) or life experiences (alternatively certified) (Wilson & Floden, 2003)? Cantrell and Weeks (2004) found that administrators in Oklahoma preferred agricultural education teachers who were traditionally certified (TC) to those who were alternatively certified (AC). TC teachers have pedagogical preparation (Robinson, 2010) whereas AC teachers do not (Darling-Hammond, 2000; Feistritzer & Haar, 2008; Lynch, 1996; Walsh & Jacobs, 2007). However, generally, AC teachers have industry experiences (Ruhland & Bremer, 2002) whereas TC teachers do not. Therefore, which set of experiences, skills, knowledge, and education leads to employability for those who have a desire to teach? Answering this question has implications for how teacher preparation equips aspiring teachers for employment.

This study was framed using the human capital theory. Human capital is based on a person’s acquisition of knowledge, skills, experiences, and education (Becker, 1964; Little, 2003; Shultz, 1971; Smith, 2010; Smylie, 1996). Human capital is used widely to explain employability (Becker, 1964); thus, as people increase their human capital, they become more employable, especially when their human capital deals with learning new, “sector-specific” skills (Smith, 2010, p. 42). As individuals develop and acquire these skills, they should become more competent at performing their trade (Heckman, 2000). Employees are more valuable if their human capital results in increased profits within their job (Lepak & Snell, 1999). Although human capital has been used widely in economics literature, it can also be used to describe the value of teachers in school systems (Smylie, 1996).

Human capital is based on how unique an individual’s skills are regarding a potential job and how much the employer values those skills (Lepak & Snell, 1999). However, research determining which areas of human capital is most valued and unique within teacher development and preparation is lacking. Hess (2000) stated, “there is some agreement on what teachers should know but no consensus on how to . . . ensure that they have mastered essential skills or knowledge” (p. 169). Therefore, the question remains – which factors of human capital are valued most by school principals?

**Purpose of the Study**

The purpose of this experimental study was to determine which factors of human capital were valued most by principals regarding their decisions to interview candidates, based on teacher resumes. The following objectives guided the study.

1. Describe the variance in factors of human capital that principals desire most.
2. Describe the interaction between factors of human capital in assessing fit of a teacher candidate.
3. Describe the association between the factors of human capital and principals’ decisions to interview the candidates or not.
4. Describe what type of teacher candidate receives an interview.

The following hypotheses guided the statistical analysis of the study:

H₀₁: There is no variance in overall mean resume scores due to the interaction of rigor, certification, and sex.

H₀₂: There is no difference in the overall mean resume score between academically rigorous and non-rigorously prepared teacher candidates.

H₀₃: There is no difference in the overall mean resume score between traditionally and alternatively certified teacher candidates.

H₀₄: There is no difference in the overall mean resume score between male and female teacher candidates.

H₀₅: Rigor has no association with principals’ decision to interview.
H₀₆: Certification type has no association with principals’ decision to interview.
H₀₇: Sex has no association with principals’ decision to interview.

**Methods**

This experimental study employed a completely randomized factorial two-by-four (CRF-24) design (Kirk, 1995), and focused on all principals who worked at schools that have an existing agricultural education program (N = 351) in Oklahoma during the 2011-2012 academic year. The frame for the study was adopted from a database used and shared by state staff program specialists at the Agency of Career and Technology Education in Oklahoma. Within the database were principals’ names, phone numbers, school name, mailing addresses, and electronic mail addresses. In the case of three principals, incomplete data existed. As such, the researchers conducted an Internet search and made phone calls to the schools to obtain the appropriate electronic mailing address to update the database and reduce frame error. A MANOVA was utilized to ensure homogeneity of principals assigned to each group based on age, years of experience, and school size, which was non-significant (V = .05, F(7, 74) = 1.605, p < .05).

Using the human capital theory as a frame, the researchers developed the instrument used for this study (see Figure 1). Because resumes are generally the first step to a candidate being selected for a job interview (Cole, Field, & Giles, 2003), eight “fictitious” resumes were created and various treatment variables were manipulated for comparisons. Each resume contained one of the completely crossed treatment combinations of two variables related to human capital – characteristics and sex. For instance, the resume for James Smith (see Table 1) was designed so that the candidate was traditionally certified and strong in academic rigor. Specifically, the resume for James Smith consisted of having a high grade point average, being a Truman Scholar finalist, and serving on the Dean’s List. In contrast, the resume for Susan Martin was designed so that the candidate was alternatively certified and exhibited weak academic rigor. In particular, no student teaching experience was denoted on the resume. Rather, a degree in animal science and experiences as a ranch manager were listed, indicating alternative certification status. Each of the ensuing resumes was altered so that a combination of treated variables existed. So as not to be biased in name selection, the website, http://www.census.gov/genealogy/names/names_files.html, that represented the top ten male and female names of 2011 was used to determine the names found in the candidates’ resumes. Each resume was kept at a one-page minimum to avoid taxing the principals and ensure consistency.

The researcher-designed resume instruments served as the medium by which the various treatment combinations were administered (see Table 1). Each resume consisted of four sections that would be identified in a typical resume: education, relevant experience, FFA experience, and college and university involvement (see Figure 1). Polarity of both academic rigor and type of certification were sought through manipulations in the education and relevant experience sections of the resume. The resumes of candidates who were academically rigorous included a 4.0 Grade Point Average (GPA), demanding coursework, and recognition associated with academic success. Candidates who were academically non-rigorous reported a 2.0 GPA, introductory coursework only, and no academic recognitions. Candidates who were certified through a traditional route had an agricultural education degree and listed their student teaching experience. Candidates who were certified through an alternative route had a degree in animal science and listed their experience working in the agricultural industry. Both the FFA experiences and college or university involvement sections were identical on all eight resumes, as they were not of interest to this study. Thus, they were controlled and used for assessing for reliability.

The researchers were careful to ensure that each of the four sections of the resume consisted of 16 bullet points and followed the same overall format. Further, each resume contained 184 to 197 total words and followed strict formatting guidelines as to prevent principal bias (see Table 1).
Table 1
Overview of the Treatment

<table>
<thead>
<tr>
<th>Resume # - Name</th>
<th>Sex</th>
<th>Certification</th>
<th>Academic Rigor</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 – James Smith</td>
<td>X</td>
<td>X TC</td>
<td>X Non-Rigor</td>
</tr>
<tr>
<td>2 – David Anderson</td>
<td>X</td>
<td>X AC</td>
<td>X Non-Rigor</td>
</tr>
<tr>
<td>3 – Robert Brown</td>
<td>X</td>
<td>X</td>
<td>X Non-Rigor</td>
</tr>
<tr>
<td>4 – Michael Miller</td>
<td>X</td>
<td>X</td>
<td>X Non-Rigor</td>
</tr>
<tr>
<td>5 – Mary Johnson</td>
<td>X</td>
<td>X AC</td>
<td>X Non-Rigor</td>
</tr>
<tr>
<td>6 – Barbara Wilson</td>
<td>X</td>
<td>X</td>
<td>X Non-Rigor</td>
</tr>
<tr>
<td>7 – Linda Davis</td>
<td>X</td>
<td>X AC</td>
<td>X Non-Rigor</td>
</tr>
<tr>
<td>8 – Susan Martin</td>
<td>X</td>
<td>X AC</td>
<td>X Non-Rigor</td>
</tr>
<tr>
<td>Totals</td>
<td>4</td>
<td>4 TC</td>
<td>4 Non-Rigor</td>
</tr>
</tbody>
</table>

Note. \( ^1\)TC = Traditionally Certified; AC = Alternatively Certified

Part one of the instrument consisted of a resume scoring rubric where principals were asked to utilize a scale of 1 to 10, with 1 being worst and 10 being best, to score each section of the resume. The four scores were added to calculate an overall resume score. Part two of the questionnaire consisted of selected, personal characteristics data of the principals. The researchers were interested in both homogeneity of principals’ characteristics between groups and future analysis of how their previous experiences, such as sex, years of experience, disciplines in which they taught, disciplines in which they were certified to teach, and FFA membership history as a youth, affected the way in which they screened the resumes. Thus, for the purpose of this study, the researchers reported only the quantitative data collected in Part I of the questionnaire.

Figure 1. Sample of Resume #1: Male, Rigorous, Traditionally Certified Candidate; Resume #8: Female, Non-Rigorous, Alternatively Certified Candidate.
Face and content validity was established on the resumes by faculty in teacher preparation and statistics at Oklahoma State University. Reliability was established through a pilot test of the instrument to principals not randomly selected to participate in the study. Because rhetoric is especially important when writing effective resumes (Amare & Manning, 2009), it was important to determine if principals could distinguish between traditionally certified and alternatively certified resumes. As such, two resumes, one being TC and the other being AC, were sent electronically to 30 principals as a pilot study. Principals were asked to evaluate and score the four sections of the resumes. Once completed, access to the resumes was suspended and the principals were asked to identify whether each candidate was traditionally or alternatively certified. Specifically, once principals had scored the resumes in the pilot study, they advanced to a page with a question asking about the certification status of the candidates. They were unable to go back and review the resumes when responding to this question, and therefore, had to answer the question based on memory. This question was especially important to the researchers as aspiring teachers in this state receive a standard teaching certificate regardless of certification route, often making it confusing to principals when assessing candidates’ teaching certificates. Anecdotal evidence exists that suggests principals do not always know if the candidates they interview are alternatively or traditionally certified. Therefore, aside from the interview itself, the resume is the only distinguishable artifact that would inform principals of a teachers’ certification route. On completing the pilot study, it was determined that over 70% of principals were able to identify correctly teachers’ certification route based on the education and experiences listed within the respective resumes. Therefore, the certification route was included in the larger study.

Each principal received an electronic mail message with the purpose of informing the principal of the study and soliciting participation. Because the study was conducted electronically, a computer system was employed to handle the random assignment of resumes to the participants. For instance, once a principal agreed to participate in the study, his or her identification number was accepted into the system automatically, and a resume was submitted for him or her to review and score. The system added resumes numerically (resume #1 through resume #8) in an attempt to ensure that equal numbers of resumes were reviewed and scored throughout the study.

To determine the number of principals needed for the study, a statistical program known as G*Power was used (Faul, Erdfelder, Lang, & Buchner, 2007), which is used to inform researchers on how many participants are needed for a particular study (Cohen, 1988; Faul et al., 2007). G*Power takes into consideration the number of people in the population, the number of variables in the study, and the amount of power desired. “Power . . . is the probability that its null hypothesis (Ho) will be rejected given that it is in fact false” (Faul et al., 2007, p. 175). When considering this study’s population (N = 351), the number of variables in the treatment (three), and a power base of .80, it was determined that 76 participants were needed (Faul et al., 2007).

The researchers followed Dillman’s (2004) recommendations for conducting electronic mail surveys. In all, principals were contacted a total of five times with an invitation to participate in the study. Specifically, an electronic mail message, complete with the resume questionnaire, was sent to all principals who were randomly selected for the study. Twenty-eight messages bounced back as undeliverable due to certain schools’ firewall protection systems. In those cases, the researchers faxed a copy of the electronic mail message to those principals soliciting their participation. The principals were asked to type the hyperlink into their web browser and participate in the study. Three additional contacts were made to principals until enough responses had been gathered necessary to detect an effect without committing a Type II error (Faul et al., 2007). In all, 83 principals participated in the study.

Findings

The first four null hypotheses sought to describe the variance in factors of human capital that principals desire most and any interaction of
those factors. To that end, an omnibus analysis of variance (ANOVA) was utilized and is summarized in Table 3. Complete reporting of descriptive statistics is found in Table 2. Levene's test of equality of error variance was used to ensure the assumption of equal variances and was not violated, and it yielded $F(7,75) = .627, p = .732$. Thus, homogeneity of variance was established. In addition, the examination of a histogram demonstrated an approximately normal distribution of the data.

Each principal provided an overall resume score using the researcher-developed instrument, and those scores were used to look for significant interactions between sex, certification type, and academic rigor. The maximum resume score was 40, and the grand mean was 26.92 ($SD = 6.82, n = 83$). Null hypothesis one was tested using the ANOVA procedure. The interaction effect of sex, certification, and rigor yielded an $F(1,75) = .205, p = .652, \eta^2_p = .000$, sex and certification yielded an $F(1,75) = .012, p = .915, \eta^2_p = .000$, sex and rigor yielded an $F(1,75) = .588, p = .446, \eta^2_p = .008$, certification and rigor yielded an $F(1,75) = 1.05, p = .308, \eta^2_p = .014$; thus, all interactions were determined to be non-significant, and null hypothesis one failed to be rejected.

Table 2
Descriptive Statistics

<table>
<thead>
<tr>
<th>Treatment Combination</th>
<th>$M$</th>
<th>$SD$</th>
<th>$n$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male – Traditional – Rigor</td>
<td>30.60</td>
<td>5.74</td>
<td>10</td>
</tr>
<tr>
<td>Male – Traditional – Non-Rigor</td>
<td>22.43</td>
<td>7.34</td>
<td>14</td>
</tr>
<tr>
<td>Male – Alternative – Rigor</td>
<td>28.07</td>
<td>5.58</td>
<td>14</td>
</tr>
<tr>
<td>Male – Alternative – Non-Rigor</td>
<td>24.20</td>
<td>6.30</td>
<td>10</td>
</tr>
<tr>
<td>Female – Traditional – Rigor</td>
<td>30.63</td>
<td>5.76</td>
<td>8</td>
</tr>
<tr>
<td>Female – Traditional – Non-Rigor</td>
<td>26.00</td>
<td>7.64</td>
<td>10</td>
</tr>
<tr>
<td>Female – Alternative – Rigor</td>
<td>29.10</td>
<td>6.64</td>
<td>10</td>
</tr>
<tr>
<td>Female – Alternative – Non-Rigor</td>
<td>26.14</td>
<td>6.01</td>
<td>7</td>
</tr>
<tr>
<td>Total</td>
<td>26.92</td>
<td>6.82</td>
<td>83</td>
</tr>
</tbody>
</table>

Table 3
Analysis of Variance Summary Table

<table>
<thead>
<tr>
<th>Source</th>
<th>$SS$</th>
<th>$df$</th>
<th>$MS$</th>
<th>$F$</th>
<th>$p$</th>
<th>$\eta^2_p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
<td>53.21</td>
<td>1</td>
<td>53.21</td>
<td>1.28</td>
<td>.262</td>
<td>.017</td>
</tr>
<tr>
<td>Certification</td>
<td>5.65</td>
<td>1</td>
<td>5.65</td>
<td>.135</td>
<td>.714</td>
<td>.002</td>
</tr>
<tr>
<td>Rigor</td>
<td>475.06</td>
<td>1</td>
<td>475.06</td>
<td>11.38*</td>
<td>.001</td>
<td>.132</td>
</tr>
<tr>
<td>Sex * Certification</td>
<td>.48</td>
<td>1</td>
<td>.48</td>
<td>.012</td>
<td>.915</td>
<td>.000</td>
</tr>
<tr>
<td>Sex * Rigor</td>
<td>24.54</td>
<td>1</td>
<td>24.54</td>
<td>.588</td>
<td>.446</td>
<td>.008</td>
</tr>
<tr>
<td>Certification * Rigor</td>
<td>43.93</td>
<td>1</td>
<td>43.93</td>
<td>1.053</td>
<td>.308</td>
<td>.014</td>
</tr>
<tr>
<td>Sex * Certification * Rigor</td>
<td>8.55</td>
<td>1</td>
<td>8.55</td>
<td>.205</td>
<td>.652</td>
<td>.003</td>
</tr>
<tr>
<td>Error</td>
<td>3129.99</td>
<td>75</td>
<td>41.73</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>63940.00</td>
<td>83</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*p < .05.

The second, third, and fourth null hypotheses stated that there were no statistically significant differences in resume scores when comparing sex, certification type, and level of academic rigor respectively. Mean scores of female resumes were 27.97 ($SD = 6.65$), and males mean score was 26.15 ($SD = 6.90$). There was a non-significant main effect of sex on the overall resume score, $F(1,75) = 1.28, p = .262, \eta^2_p = .017$ with a power of .200. Traditionally certified candidate resumes scored a mean of 27.41 ($SD = 1.02$), while alternatively certified candidates mean score was 26.88 ($SD = 1.04$). Again, there was a non-significant main effect of certification type on resume scores, $F(1,75) = .14, p = .714, \eta^2_p = .002$ and a power of .065.
Resumes indicating high academic rigor scored a mean of 29.60 ($SD = 1.02$), and those of low academic rigor scored a mean of 24.69 ($SD = 1.04$). There was a statistically significant difference between the level of academic rigor and the principals’ scores of the resumes, $F(1,75) = 11.38$, $p = .001$, $\eta_p^2 = .132$, and a power of .915. As a result of these analyses, the second and third null hypotheses were retained, and the fourth null hypothesis was rejected.

The fifth, sixth, and seventh null hypotheses sought to determine if the level of academic rigor, sex, and certification type is independent of the principals’ decision to interview a candidate. Once the principals scored their respective resume, they were asked a simple question, “Would you invite this candidate for an interview based on this resume?” These yes and no answers were used as categorical data in the employment of Chi-Square tests of association. The Chi-Square tests of association are presented in Tables 4, 5, and 6.

Table 4
Contingency Table by Interview Decision and Sex of Candidate

<table>
<thead>
<tr>
<th>Interview Decision</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>Male Candidate</td>
<td>30 (62.5%)</td>
</tr>
<tr>
<td>Female Candidate</td>
<td>22 (62.9%)</td>
</tr>
<tr>
<td>Total</td>
<td>52</td>
</tr>
</tbody>
</table>

$\chi^2 (1, n = 83) = .001, p = .974$

Table 5
Contingency Table by Interview Decision and Academic Rigor of Candidate

<table>
<thead>
<tr>
<th>Interview Decision</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>Rigorous</td>
<td>31 (73.8%)</td>
</tr>
<tr>
<td>Non-Rigorous</td>
<td>21 (51.2%)</td>
</tr>
<tr>
<td>Total</td>
<td>52</td>
</tr>
</tbody>
</table>

$\chi^2 (1, n = 83) = 4.525, p = .033$

The 83 principals agreed to interview 62.5% of the males, and 62.9% of the females (see Table 4). The Chi-Square yielded a value of .001, which was statistically non-significant. Teacher candidates whose resume indicated a high level of academic rigor were given an interview 73.8% of the time, while only 51.2% of the academically non-rigorous candidates received an interview (see Table 5). Academic rigor was statistically significantly associated with the principals’ decision to provide an interview, as made evident by the 4.525 Chi-Square score ($p = .033$). Finally, 64.3% of teacher candidates who were traditionally certified received an interview, and 61.0% of the alternatively certified teachers received interviews (see Table 6). The Chi-Square yielded a statistically non-significant score of .097, which indicated that certification status made no difference in principals’ decisions to interview candidates.
Table 6
Contingency Table by Interview Decision and Certification Type of Candidate

<table>
<thead>
<tr>
<th></th>
<th>Interview Decision</th>
<th>No</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes</td>
<td>27 (64.3%)</td>
<td>42</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>15 (35.7%)</td>
<td></td>
</tr>
<tr>
<td>Traditional Certification</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alternative Certification</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>52</td>
<td>83</td>
</tr>
</tbody>
</table>

$\chi^2 (1, n = 83) = .097, p = .755$

Objective four was to describe the type of teacher candidate resume that leads to an interview. Traditionally certified males and females, who exhibited a high level of academic rigor, received the highest interview percentages of 80% and 88%, respectively (see Table 7).

Table 7
Percentage of Candidates in Each Resume Category that Received an Interview (n = 52)

<table>
<thead>
<tr>
<th></th>
<th>Traditional Certification</th>
<th>Alternative Certification</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Rigor</td>
<td>Non-Rigor</td>
</tr>
<tr>
<td>Male</td>
<td>8/10 (80%)</td>
<td>6/14 (43%)</td>
</tr>
<tr>
<td>Female</td>
<td>7/8 (88%)</td>
<td>6/10 (60%)</td>
</tr>
</tbody>
</table>

Conclusions

The purpose of this experimental study was to determine which factors of human capital were valued most by principals regarding their decisions to interview candidates based on teacher resumes. It is clear that principals in this study prefer academic rigor to that of all other factors of human capital. Although not overly shocking, this finding contradicts numerous studies (Ballou, 1996; Sulaver, 2008; Wayne & Youngs, 2003; Weeks, 2006) that found academic rigor (i.e., GPA and academic awards and honors) was devalued by principals when hiring teachers.

Sex had no bearing on principals’ decisions to interview candidates. In fact, principals were willing to interview almost identical numbers of males (62.5%) and females (62.9%), respectively. This finding is encouraging as only roughly 13% of the statewide population of agricultural education teachers in Oklahoma is female, currently (K. Murray, personal communication, September 4, 2010). Anecdotally, some aspiring female teachers in Oklahoma have expressed concern over whether or not they will be taken seriously for future jobs. They believe teaching agriculture is a male-only profession in Oklahoma and that they will struggle to obtain a teaching job. However, the findings of this study are encouraging. Regardless of sex, it was apparent that principals seek aspiring teachers who were academically rigorous as students, not whether they were male or female.

Regarding certification status, there was no statistically significant difference between the proportion of traditionally and alternatively certified teachers that principals were willing to interview. Specifically, principals were willing to interview 64.3% ($f = 27$) of candidates who were traditionally certified and 61.0% ($f = 25$) of candidates who were alternatively certified. Cantrell and Weeks (2004) determined that administrators in Oklahoma preferred TC candidates to AC candidates. However, the same claims cannot be made from this study. Although two more TC candidates were selected to receive interviews, the differences between them and AC teacher candidates were not statistically significant, indicating that principals
have no bias toward candidates who student taught and are experienced in pedagogy. Finally, when combining all factors of human capital, candidates who were traditionally certified and had strong academic rigor were most likely to receive interviews, which refutes the assertions of Weeks (2006) and Ballou (1996). The second most likely to receive interviews were those candidates who were alternatively certified and had strong academic rigor.

Recommendations for Research

This study sought to determine which factors of human capital are valued most by principals regarding the resumes of teacher candidates. However, resumes are but one artifact used to apply for a job. Teachers also submit applications and cover letters, which are important components to the screening process (Sulaver, 2008). Cantrell and Weeks (2004) noted that being strong academically does not ensure employability as a teacher. Therefore, what does? Future research should assess principals’ ratings of various cover letters and application materials to determine the decisions principals make regarding these artifacts.

The findings of this study are limited to Oklahoma. However, each state’s teacher certifying institution(s) should understand more about how its hiring officials make decisions regarding teacher employability. Therefore, it is recommended that this approach to collecting data be replicated in other states to determine themes deemed most important for agricultural education teachers. Further, it is acknowledged by the researchers of this study that a principal is not the sole person who does all of the decisions when hiring new teachers. As such, further studies should assess individuals such as superintendents, school board members, and other stakeholders who have a role in the hiring of agricultural education teachers in Oklahoma and beyond.

The resounding finding of this study is that principals desire candidates with strong academic rigor. However, what is not clear is the type of academic rigor principals value most. For instance, do principals desire candidates who have double-majored in another technical area over those with a degree only in agricultural education? Likewise, do principals seek individuals who have minored in another technical area versus those who have not? Further research should explore these areas.

Recommendations for Practice

These findings should be shared with principals in Oklahoma at their annual conference. Based on the pilot data, it is assumed that some principals “default” to believing every teacher aspirant is traditionally certified and prepared pedagogically. It is also clear that a few principals are not able to distinguish which teachers are traditionally certified and which ones are alternatively certified based solely on the resumes. This is problematic. As such, principals should be made aware of and trained to recognize these differences so that they can make the best decision possible during the screening process.

Based on the findings of this study, faculty in agricultural education at Oklahoma State University should encourage students to improve their human capital in the area of academic rigor specifically. Students should be encouraged to improve their GPA and scholastic standings by receiving free tutoring and taking advantage of the writing center provided to increase students’ literary skills at Oklahoma State University. Further, students should be advised to take advanced coursework in science and mathematics.

Implications and Discussion

The findings of this study indicate clearly that principals seek aspiring teachers who are
The Effect of Human Capital…

Robinson & Baker

competent, smart, and determined – as evidenced by their overwhelming desire for interviewing teachers with elevated GPAs, academic honors and awards, and rigorous coursework. Yet, this finding contradicts previous work done by Cantrell and Weeks (2004), which found that a candidate’s GPA was not a significant factor in principals’ decision to hire an agriculture teacher. Yet, this study showed that, with all things being equal, academic rigor was the lone aspect of human capital that made a statistically significant difference. However, rarely in life are all things equal. For instance, the adage, “It’s not what you know but who you know that matters,” applies here. Therefore, an implication exists that politics plays a large role in the hiring process of individuals in various sectors. As such, perhaps there are other factors (i.e., geographic location of the candidate) to consider regarding aspiring teachers’ human capital.

What is somewhat concerning is the lack of attention these principals placed on teachers’ certification status. With all things being equal, principals selected traditionally certified teachers. However, when given options, it appeared as though principals were willing to compromise the student teaching experience and pedagogical preparation for a more well-rounded candidate. Why is that? Could it be that the pressure to have students perform on end-of-instruction, standardized tests is so great that principals are willing to forgo the pedagogical experiences of candidates to find a teacher who has high, overall, general intelligence? If so, perhaps pre-service teachers should be encouraged to not only take more rigorous coursework, but also to minor or double major in other areas in addition to agricultural education. The findings of this study revealed that principals were willing to issue interviews to candidates at all costs so long as they had been academically rigorous while in college.

The preparation of teachers is a difficult endeavor. It is a struggle for teacher educators to ensure that pre-service teachers receive enough rigorous coursework and pedagogy while being required to maintain student credit hours to under 124. Are there ways in which pre-service teachers can learn pedagogy while taking upper-level coursework that is rigorous in nature? If so, how? Discussions are needed to understand how to accomplish this dilemma better.

It is refreshing that principals desire teachers who are academically astute. However, efforts should be made to improve teacher pay and increase incentives to teach for those who are in the upper echelon regarding academic rigor. Too often, students do not consider teaching seriously due to the fact that they can find industry jobs that pay better and have enticing incentive programs based on their skills and abilities. Although this issue likely will not be resolved any time soon, teacher educators at this institution will continue to recruit students to the major who are academically rigorous. Further, all current students at Oklahoma State University will be encouraged to provide their best efforts while at college, by taking advantage of the free tutoring sessions offered at this institution, and gain as many robust experiences as possible prior to applying for teaching jobs.

References


J. SHANE ROBINSON is an Associate Professor of Agricultural Education in the Department of Agricultural Education, Communications and Leadership at Oklahoma State University, 457 Agricultural Hall, Stillwater, OK 74078-6032, shane.robinson@okstate.edu
MARSHALL A. BAKER is a High School Principal at Lincoln Academy Stillwater Public Schools, 215 East 12th Avenue, Stillwater, OK 74074, marshall.baker@okstate.edu
A 20-Year Comparison of Teachers’ Agricultural Mechanics Laboratory Management Competency

Billy R. McKim  
Texas A&M University  
P. Ryan Saucier  
Texas State University – San Marcos

Agricultural mechanics laboratory management skills are essential for school-based agriculture teachers who instruct students in an agricultural mechanics laboratory (Bear & Hoerner, 1986). McKim and Saucier (2011) suggested the frequency and severity of accidents that occur in these laboratories can be reduced when these facilities are managed by educators who are competent and knowledgeable in the area of laboratory safety and facility management. This study investigated changes in Missouri agriculture teachers’ perceived agricultural mechanics laboratory management competency from 1989 to 2008, percent changes between 1989 and 2008 and effect size were used to describe changes in importance and ability of the selected competencies. Results indicated that teachers in 2008 had more teaching experience than their predecessors, less university semester credit hours of agricultural mechanics instruction, taught courses with greater student enrollment in laboratories that had less working space per student. Further, teachers’ perceptions of the importance of agricultural mechanics laboratory management competencies had a negligible change. However, the changes in teachers’ perceived ability to perform development, writing, and planning competencies were notable.

Keywords: agricultural mechanics; laboratory management competency; agricultural education, professional development

According to Phipps and Osborne (1988), a total secondary agricultural education program consists of three essential and interdependent components. Classroom and laboratory instruction; independent experiential learning, commonly known as Supervised Agricultural Experience (SAE); and participation in the student leadership organization, specifically the National FFA Organization. Specialized laboratory facilities are often an integral element used for each of these three components (McKim & Saucier, 2011).

Agricultural education laboratories provide opportunities for students to actively engage in scientific inquiry and applications (Osborne & Dyer, 2000. Further, Hubert, Ullrich, Lindner, and Murphy (2003) wrote “agricultural education programs offer many unique hands-on opportunities for students to develop both valuable academic and vocational skills” (p. 1). This is especially true for the instructional area of agricultural mechanics. Phipps, Osborne, Dyer, and Ball (2008) noted that the primary objective of agricultural mechanics education is the development of the abilities necessary to perform the mechanical activities to be completed in agriculture. Johnson, Schumacher, and Stewart (1990) stated that students learn important psychomotor skills in agricultural mechanics education and that much of the instruction takes place in the school agricultural mechanics laboratory.

Laboratories are essential educational tools for agricultural mechanics programs. As Johnson and Schumacher (1989) noted, much of the instruction of agricultural mechanics information takes place in a laboratory setting. Phipps, et al. (2008) estimated that in many courses, the time allocated for instruction in agricultural mechanics comprises 25% to 40% of the total instructional time. However, Saucier, Schumacher, Funkenbusch, Terry, and
Johnson (2008) found that teachers used the laboratory for up to 66% of the allocated instructional time in some agricultural mechanics courses. Shinn (1987) reported that the amount of time devoted to laboratory instruction may comprise one-third to two-thirds of the total instructional time in many secondary agricultural education programs. More recently, Saucier, Terry, and Schumacher (2009) found that Missouri agricultural educators spent almost 10 hours per week supervising students in an agricultural mechanics laboratory. Bear and Hoerner (1986) noted laboratory experiences are an integral component of agricultural mechanics instruction and efficient management of the school agricultural mechanics laboratories are essential to maximizing student learning. With the amount of instructional time spent in the various agricultural education laboratories (i.e., animal science laboratory, greenhouse, agricultural mechanics laboratory, floral design laboratory, etc.) in the U.S., it is critical that agriculture teachers receive laboratory management education.

According to Hubert, Ulrich, Lindner, and Murphy (2003), “if skill development is the focus of laboratory instruction, then thorough attention to all its components, including safety instruction, is essential” (p. 3). Johnson and Fletcher (1990) stated that agricultural mechanics students are exposed to equipment, materials, tools, and supplies that are potentially hazardous to their health and that could cause injury or death. Shinn (1987) stated that the agricultural mechanics laboratory must be a safe and well organized environment if optimum student learning is to occur. In 1986, Burke described practices associated with efficient laboratory management. He listed the regulation of environmental factors, control of consumable supplies and storage of tools as areas that are important for the efficient and safe management of the agricultural mechanics laboratory. Further emphasizing the importance of safety in the agricultural mechanics laboratory, Swan (1992) noted that instructional safety programs are a must, and therefore, should be of high priority to the instructor. The most important responsibility of the instructor is to ensure the safety of the students.

In addition to the previously noted studies, others posited that among the most effective instructional techniques reported by teachers, were demonstrations, laboratories, and supervised student projects (Myers & Dyer, 2004)—arguably, the most frequently used methods for teaching agricultural mechanics. Saucier et al. (2008) noted that pre-service and existing teachers must be properly educated in agricultural mechanics laboratory management to provide a safe and efficient laboratory learning environment for agricultural mechanics students. This is especially true with the increased emphasis and scrutiny of Science, Technology, Engineering, and Mathematics (STEM) integration into agricultural education courses, evidenced in the National Research Agenda, Priority Area 3 (Doerfert, 2011). Thus, safe and efficient laboratory conditions are essential for teachers who integrate core curricula into agricultural education programs (Thompson & Balschweid, 1999; Myers & Dyer, 2004). Unfortunately, many agricultural educators do not receive adequate preparation prior to beginning their teaching careers, or after accepting a teaching position (Foster, 1986), to safely manage an agricultural mechanics laboratory. However, longitudinal comparison of teachers’ perceived ability to establish and maintain a safe and efficient laboratory learning environment is not present in the literature.

To guide the theoretical foundation of this study, researchers utilized Bandura’s theory of self-efficacy (1997). According to Bandura, self-efficacy is defined as the “beliefs in one’s capabilities to organize and execute the course of action required to produce given attainments” (p. 3). Moreover, self-efficacy influences a person’s choices, actions, the amount of effort they give, how long they persevere when faced with obstacles, their resilience, their thought patterns and emotional reactions, and the level of achievement they ultimately attain (Bandura, 1986). See Figure 1 for an illustration of the theory of self-efficacy. According to Knobloch (2008), predetermined beliefs of teachers often influence how they connect academic content in the classroom to real-life applications in the laboratory. Based upon a review of literature, these beliefs are
developed in part to personal beliefs about the curriculum or content (Borko & Putnam, 1996; Moseley, Reinke, & Bookout, 2002; Pajares, 1992); availability of time, availability of classroom and laboratory instructional resources, level of preparation regarding the content (Thompson & Balschweid, 1999), comfort level with the content, (Knobloch & Ball, 2003), perceived value of the content (Lawrenz, 1985), past experiences with the content area (Calderhead, 1996; Thompson & Balschweid, 1999), teaching environment (Knobloch, 2001) and motivation (Bandura, 1997; Tschannen-Moran, Woolfolk-Hoy, & Hoy, 1998).

The development and performance of teachers is also influenced by the interaction of these personal and environmental factors and the situations in which they teach (Knobloch, 2001). Based upon these principles and the aforementioned review of literature, researchers sought to determine the fundamental foundational change in the need of agricultural mechanics laboratory management professional development in Missouri, as measured by the importance a teacher places on, and their ability to perform, selected agricultural mechanics laboratory management competencies.

**Purpose and Research Questions**

Agricultural mechanics continues to be one of the most popular courses in Missouri (T. Heiman, personal communication, September 2, 2008). However, more than 20 years have passed since the competence and educational needs of Missouri school-based agricultural mechanics teachers were assessed. Thus, the purpose of this study was to compare the perceptions of school-based agriculture educators in Missouri who manage agricultural mechanics laboratories, between 1989 and 2008, regarding selected agricultural mechanics laboratory management competencies. The following research questions were investigated to accomplish this purpose:

1. What were the personal and professional characteristics of school-based agricultural educators in Missouri who are responsible for managing an agricultural mechanics laboratory, specifically: age, sex, credit hours of agricultural mechanics coursework taken, hours spent supervising students in the agricultural mechanics laboratories per week, overall student enrollment in the agricultural mechanics program, and the largest student enrollment in an agricultural mechanics class?

![Figure 1. An illustration of the theory of self-efficacy (Bandura, 1997)](image-url)
2. Did Missouri school-based agricultural educators’ perceptions of the importance of selected agricultural mechanics laboratory management competencies change from 1989 to 2008?

3. Did Missouri school-based agricultural educators’ perceptions of their ability to perform selected agricultural mechanics laboratory management competencies change from 1989 to 2008?

Procedures

“Meta-analysis is a form of secondary analysis of pre-existing data that aims to summarize and compare results from different studies” (Newton & Rudestam, 1999, p. 281). Furthermore, meta-analyses “serve to combine results from multiple studies, and consequently, allow us to diminish our reliance on statistical tests from individual studies” (p. 281). Therefore, a form of meta-analysis was conducted by including the results reported by Johnson in 1989 and data collected as part of this study. Hence, the purpose of this study was to measure perceptual change of the importance of teachers’ ability to instruct selected agricultural mechanics laboratory management competencies. The target populations for this study were school-based agriculture teachers responsible for managing an agricultural mechanics laboratory in Missouri, during 1989 and 2008.

In 1989, Johnson noted that 240 school-based agriculture teachers, in Missouri, were responsible for managing an agricultural mechanics laboratory. Of the 240 school-based agriculture teachers, Johnson randomly selected and invited 200 school-based agriculture teachers to participate in a mailed survey that included 50 selected agricultural mechanics laboratory management competencies (Johnson & Schumacher, 1989). After three points of contact, Johnson received 168 (83%) usable responses, which served as the population for the initial point for comparison for this study.

In 2008, the agricultural education district supervisors from the Missouri Department of Elementary and Secondary Education (DESE) identified 424 school-based agriculture teachers, in Missouri, who were responsible for managing an agricultural mechanics laboratory. A simple-random sample of 205 school-based agriculture teachers was selected (Krejcie & Morgan, 1970) and served as the population for the second point of comparison for this study.

For consistency, data collection procedures in 2008 followed similar procedures to those implemented by Johnson in 1989. The data collection instrument used by Johnson in 1989 was initially developed by Johnson and Schumacher in 1988, using the Delphi technique with input from a national panel of agricultural mechanics education experts. Johnson’s 1989 instrument was a two-section instrument: The first section contained 50 agricultural mechanics laboratory management competency statements with two, five-point summed rating scales—one reflecting the importance of each competency, the other reflecting the subject’s perceived ability to perform each competency. The purpose of the second section was to collect demographic information. Johnson noted a panel of experts was used to assess face validity of the instrument prior to data collection. Johnson further noted Cronbach’s alpha coefficients, post hoc, ranged from .63 to .88 (n = 168).

The data collection instrument used to collect data in 2008 was a two-section, modified version of Johnson’s 1989 instrument. Modification of the instrument was necessary to split multiple-component (double-barreled and triple barreled) competencies into single-component competencies; thus, the original 50 competencies were expanded to 70 competencies. The second section of the instrument was designed to collect relevant demographic information from respondents.

The modified instrument used to collect data in 2008 was submitted to a panel of experts to determine face and content validity. The panel of experts (n = 7) was composed of four university faculty members with expertise in agricultural systems management, a university faculty member with expertise in agriculture teacher education, a teacher development specialist from the agricultural education division of DESE, and a university faculty member with expertise in research methods and data collection instrument design. To estimate reliability of the modified instrument, a pilot test composed of randomly selected school-based agriculture teachers (n = 30), not selected to comprise the 2008 compari-
son sample, yielded acceptable Cronbach’s alpha coefficients, as defined by Garson (2008), that ranged from .95 to .97.

Once validity and reliability were established, the instrument was administered to the 2008 comparison sample. Following Dillman’s (2007) recommendations, subjects were contacted five times via email and U.S. mail. Usable responses were received from 110 Missouri school-based agriculture teachers resulting in a 55% response rate. Non-response error was a relevant concern. Therefore, procedures for handling nonrespondents were followed as outlined as Method 2 in Lindner, Murphy, and Briers (2001): Days to respond was used as the independent variable in regression equations, where the primary variables of interest were regressed on the variable days to respond, which yielded no significant results ($p = .603$). Despite the lack of significant results, the 55% response rate is a limitation of this study and limits the ability to generalize beyond the respondents.

Data analyses were guided by the recommendations of Cohen (1988), Newton and Rudestam (1999), and Thalheimer and Cook (2002), regarding meta-analysis. Data relative to Johnson’s 1989 study were reportedly analyzed using Statistical Analysis System; frequency, percentages, means, and standard deviations were reported. Data relative to the 2008 study were analyzed using SPSS 17.0; frequency, percentages, means, and standard deviations were reported. Double-barreled items from the 1989 study that were subsequently revised in the 2008 study were excluded from the analyses in this study to ensure the most accurate comparisons. Comparative analyses of the 33 competencies that corresponded between the 1989 and 2008 data were conducted using a Microsoft Excel® spreadsheet for calculating Cohen’s $d$ from $t$-tests, developed by Thalheimer and Cook (2002); Cohen’s $d$ and percent change were reported for each competency. Furthermore, interpretations of Cohen’s $d$ and percent change were based on Thalheimer and Cook’s interpretations.

**Results**

A comparative summary of the demographic data from 1989 and 2008 was presented in Table 1. On average, school-based agriculture teachers had a greater amount of experience in 2008 than 1989. However, the number of total university semester credit hours of agricultural mechanics coursework was reduced by 35% from 1989 ($M = 17.39; SD = 9.93$) to 2008 ($M = 11.30; SD = 9.81$). The average number of hours per week devoted to agricultural mechanics laboratory instruction decreased and the number of students in the largest agricultural mechanics classes increased. The age of agricultural mechanics laboratories increased slightly and the size ($ft^2$) of agricultural mechanics laboratories decreased slightly. Annual consumable budgets, however, increased on average.

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>1989</th>
<th>2008</th>
<th>Δ M</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total years of teaching experience</td>
<td>168</td>
<td>10.95</td>
<td>8.02</td>
</tr>
<tr>
<td>Total university semester credit hours of agricultural mechanics coursework</td>
<td>138</td>
<td>17.39</td>
<td>9.93</td>
</tr>
<tr>
<td>Average hours per week devoted to agricultural mechanics laboratory instruction</td>
<td>163</td>
<td>10.14</td>
<td>4.91</td>
</tr>
<tr>
<td>Number of students in largest agricultural mechanics class</td>
<td>168</td>
<td>15.39</td>
<td>6.02</td>
</tr>
</tbody>
</table>

(Table 1 continues)
A comparative summary of perceived importance of agricultural mechanics laboratory management competencies between 1989 and 2008 was listed in Table 2. The competency with the greatest percent increase in perceived importance of agricultural mechanics laboratory management competencies between 1989 and 2008 was maintaining computer based records with a large increase ($\%\Delta = 29$) and a large effect size ($d = .99$). Making minor repairs to the agricultural mechanics laboratory facility had the next greatest percent change in perceived importance ($\%\Delta = 15; d = .46$), followed by making major agricultural mechanics lab equipment repairs ($\%\Delta = 14; d = .40$), both of which had a medium increase in percent change and medium effect size. The agricultural mechanics laboratory management competencies with the greatest percent decrease in perceived importance of agricultural mechanics laboratory management competencies between 1989 and 2008 were developing procedures for efficient storage/distribution of consumable supplies ($\%\Delta = -8; d = .43$) and silhouetting tool/equipment cabinets ($\%\Delta = -8; d = .27$), which indicated a small decrease for both competencies, with a medium and small effect size respectively.

Table 2
A Comparison of Missouri School-Based Agriculture Educators’ Perceptions of the Importance of Selected Agricultural Mechanics Laboratory Management Competencies Changed from 1989 ($n = 168$) to 2008 ($n = 110$)

<table>
<thead>
<tr>
<th>Competency</th>
<th>1989</th>
<th>2008</th>
<th>Cohen’s $d$</th>
<th>$%\Delta$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maintaining computer based student academic records</td>
<td>$M = 2.91$</td>
<td>$SD = 1.06$</td>
<td>$M = 3.74$</td>
<td>$SD = 0.99$</td>
</tr>
<tr>
<td>Making minor repairs to the agricultural mechanics laboratory facility</td>
<td>$M = 3.19$</td>
<td>$SD = 1.09$</td>
<td>$M = 3.66$</td>
<td>$SD = 0.89$</td>
</tr>
<tr>
<td>Making major agricultural mechanics lab equipment repairs</td>
<td>$M = 3.66$</td>
<td>$SD = 0.88$</td>
<td>$M = 3.99$</td>
<td>$SD = 0.77$</td>
</tr>
<tr>
<td>Developing a written statement of agricultural mechanics lab policies/procedures</td>
<td>$M = 3.73$</td>
<td>$SD = 0.88$</td>
<td>$M = 4.01$</td>
<td>$SD = 0.84$</td>
</tr>
<tr>
<td>Developing a maintenance schedule for agricultural mechanics equipment</td>
<td>$M = 3.58$</td>
<td>$SD = 0.79$</td>
<td>$M = 3.82$</td>
<td>$SD = 0.77$</td>
</tr>
<tr>
<td>Competencies</td>
<td>1989 M</td>
<td>1989 SD</td>
<td>2008 M</td>
<td>2008 SD</td>
</tr>
<tr>
<td>----------------------------------------------------------------------------</td>
<td>--------</td>
<td>---------</td>
<td>--------</td>
<td>---------</td>
</tr>
<tr>
<td>Maintaining the agricultural mechanics laboratory in compliance with OSHA standards</td>
<td>3.85</td>
<td>0.92</td>
<td>4.11</td>
<td>0.92</td>
</tr>
<tr>
<td>Developing an accident reporting system</td>
<td>4.14</td>
<td>0.92</td>
<td>4.39</td>
<td>0.85</td>
</tr>
<tr>
<td>Arranging for a professional service person to make major equipment repairs</td>
<td>3.71</td>
<td>0.97</td>
<td>3.92</td>
<td>0.90</td>
</tr>
<tr>
<td>Administering first aid</td>
<td>4.22</td>
<td>0.83</td>
<td>4.42</td>
<td>0.87</td>
</tr>
<tr>
<td>Properly installing and maintaining safety devices and emergency equipment</td>
<td>4.42</td>
<td>0.74</td>
<td>4.60</td>
<td>0.66</td>
</tr>
<tr>
<td>Diagnosing malfunctioning agricultural mechanics lab equipment</td>
<td>4.18</td>
<td>0.79</td>
<td>4.33</td>
<td>0.74</td>
</tr>
<tr>
<td>Promoting laboratory safety by color coding equipment/marketing safety zones/posting appropriate safety signs and warnings</td>
<td>3.89</td>
<td>0.95</td>
<td>4.03</td>
<td>0.90</td>
</tr>
<tr>
<td>Developing educational projects/activities for students</td>
<td>3.92</td>
<td>0.73</td>
<td>4.02</td>
<td>0.71</td>
</tr>
<tr>
<td>Developing a system to document achievement of student competencies</td>
<td>3.71</td>
<td>0.86</td>
<td>3.82</td>
<td>0.81</td>
</tr>
<tr>
<td>Developing procedures to facilitate the storage/checkout/security of tools/equipment</td>
<td>3.77</td>
<td>0.87</td>
<td>3.87</td>
<td>0.85</td>
</tr>
<tr>
<td>Installing stationary power equipment</td>
<td>3.58</td>
<td>0.96</td>
<td>3.69</td>
<td>0.75</td>
</tr>
<tr>
<td>Developing a procedure to bill students for materials used in project construction</td>
<td>4.01</td>
<td>0.84</td>
<td>4.10</td>
<td>0.81</td>
</tr>
<tr>
<td>Developing a procedure to ensure proper agricultural mechanics lab clean up</td>
<td>4.14</td>
<td>0.82</td>
<td>4.22</td>
<td>0.76</td>
</tr>
<tr>
<td>Making minor agricultural mechanics equipment repairs</td>
<td>4.12</td>
<td>0.81</td>
<td>4.20</td>
<td>0.70</td>
</tr>
<tr>
<td>Estimating time required for students to complete projects/activities</td>
<td>3.58</td>
<td>0.79</td>
<td>3.66</td>
<td>0.77</td>
</tr>
<tr>
<td>Performing routine maintenance of agricultural mechanics lab equipment</td>
<td>4.11</td>
<td>0.72</td>
<td>4.18</td>
<td>0.74</td>
</tr>
<tr>
<td>Arranging equipment in the agricultural mechanics lab to enhance safety/efficiency/learning</td>
<td>4.20</td>
<td>0.73</td>
<td>4.26</td>
<td>0.67</td>
</tr>
<tr>
<td>Recognizing characteristics of quality tools/equipment</td>
<td>4.14</td>
<td>0.76</td>
<td>4.20</td>
<td>0.68</td>
</tr>
<tr>
<td>Developing a rotational plan to move students through agricultural mechanics skill areas</td>
<td>3.73</td>
<td>0.82</td>
<td>3.75</td>
<td>0.83</td>
</tr>
<tr>
<td>Developing objective criteria for evaluation of student projects/activities</td>
<td>4.01</td>
<td>0.66</td>
<td>4.03</td>
<td>0.73</td>
</tr>
<tr>
<td>Developing an identification system to deter tool/equipment theft</td>
<td>4.03</td>
<td>0.91</td>
<td>4.05</td>
<td>0.82</td>
</tr>
<tr>
<td>Inventorying shop tools, equipment and supplies</td>
<td>4.03</td>
<td>0.78</td>
<td>4.02</td>
<td>0.79</td>
</tr>
<tr>
<td>Utilizing technical manuals to order replacement/repair parts for agricultural mechanics lab equipment</td>
<td>3.89</td>
<td>0.83</td>
<td>3.90</td>
<td>0.86</td>
</tr>
<tr>
<td>Maintaining healthy environmental conditions in the laboratory</td>
<td>4.26</td>
<td>0.77</td>
<td>4.20</td>
<td>0.76</td>
</tr>
<tr>
<td>Constructing welding booths, work benches, storage areas, etc.</td>
<td>3.76</td>
<td>0.85</td>
<td>3.66</td>
<td>0.88</td>
</tr>
<tr>
<td>Updating agricultural mechanics course offerings</td>
<td>3.94</td>
<td>0.81</td>
<td>3.71</td>
<td>0.87</td>
</tr>
</tbody>
</table>
A comparative summary of perceived ability to perform agricultural mechanics laboratory management competencies between 1989 and 2008 are listed in Table 3. The competency with the greatest percent increase in perceived ability to perform agricultural mechanics laboratory management competencies between 1989 and 2008 was maintaining computer based records with a large increase (\(\%\Delta = 35\)) and a large effect size \((d = .97)\). Developing a written statement of agricultural mechanics lab policies/procedures was the competency with the next greatest percent change in perceived ability to perform \((\%\Delta = 11; d = .44)\), which indicated a small increase in percent change and medium effect size.

The agricultural mechanics laboratory management competencies with the greatest percent decrease in perceived ability to perform agricultural mechanics laboratory management competencies between 1989 and 2008 were making minor agricultural mechanics lab equipment repairs \((\%\Delta = -5; d = .26)\) and developing procedures to facilitate the storage/checkout/security of tools/equipment \((\%\Delta = -3; d = .12)\), which similar to perceptions of most competencies \((n = 21)\), was a negligible decrease. Additionally, the Cohen’s \(d\) value associated with making minor agricultural mechanics lab equipment indicated a small effect size which was the only notable effect size of the items with negative percent change values \((n = 6)\). See Table 3.

### Table 3

<table>
<thead>
<tr>
<th>Competencies</th>
<th>1989 Mean (SD)</th>
<th>2008 Mean (SD)</th>
<th>Cohen’s (d)</th>
<th>%(\Delta)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maintaining computer based student academic records</td>
<td>2.83 (1.05)</td>
<td>3.81 (0.96)</td>
<td>0.97</td>
<td>35</td>
</tr>
<tr>
<td>Developing a written statement of agricultural mechanics lab policies/procedures</td>
<td>3.38 (0.81)</td>
<td>3.75 (0.89)</td>
<td>0.44</td>
<td>11</td>
</tr>
<tr>
<td>Developing a procedure to ensure proper agricultural mechanics lab clean up</td>
<td>3.55 (0.82)</td>
<td>3.91 (0.80)</td>
<td>0.44</td>
<td>10</td>
</tr>
<tr>
<td>Developing an accident reporting system</td>
<td>3.57 (0.83)</td>
<td>3.91 (0.88)</td>
<td>0.40</td>
<td>10</td>
</tr>
<tr>
<td>Estimating time required for students to complete projects/activities</td>
<td>3.08 (0.71)</td>
<td>3.38 (0.83)</td>
<td>0.40</td>
<td>10</td>
</tr>
<tr>
<td>Developing a system to document achievement of student competencies</td>
<td>3.10 (0.79)</td>
<td>3.41 (0.88)</td>
<td>0.38</td>
<td>10</td>
</tr>
<tr>
<td>Competencies</td>
<td>1989 M</td>
<td>1989 SD</td>
<td>2008 M</td>
<td>2008 SD</td>
</tr>
<tr>
<td>------------------------------------------------------------------------------</td>
<td>--------</td>
<td>---------</td>
<td>--------</td>
<td>---------</td>
</tr>
<tr>
<td>Developing a rotational plan to move students through agricultural mechanics skill areas</td>
<td>3.26</td>
<td>0.86</td>
<td>3.58</td>
<td>0.84</td>
</tr>
<tr>
<td>Administering first aid</td>
<td>3.35</td>
<td>0.92</td>
<td>3.68</td>
<td>0.95</td>
</tr>
<tr>
<td>Developing procedures for efficient storage/distribution of consumable supplies</td>
<td>3.45</td>
<td>0.74</td>
<td>3.75</td>
<td>0.73</td>
</tr>
<tr>
<td>Developing a maintenance schedule for agricultural mechanics equipment</td>
<td>3.05</td>
<td>0.81</td>
<td>3.33</td>
<td>0.85</td>
</tr>
<tr>
<td>Promoting laboratory safety by color coding equipment/marketing safety zones/posting appropriate safety signs and warnings</td>
<td>3.26</td>
<td>0.86</td>
<td>3.53</td>
<td>0.95</td>
</tr>
<tr>
<td>Maintaining the agricultural mechanics laboratory in compliance with OSHA standards</td>
<td>3.20</td>
<td>0.87</td>
<td>3.41</td>
<td>0.92</td>
</tr>
<tr>
<td>Developing objective criteria for evaluation of student projects/activities</td>
<td>3.42</td>
<td>0.77</td>
<td>3.60</td>
<td>0.78</td>
</tr>
<tr>
<td>Arranging for a professional service person to make major equipment repairs</td>
<td>3.57</td>
<td>0.93</td>
<td>3.75</td>
<td>0.85</td>
</tr>
<tr>
<td>Arranging equipment in the agricultural mechanics lab to enhance safety/efficiency/learning</td>
<td>3.68</td>
<td>0.74</td>
<td>3.81</td>
<td>0.80</td>
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<tr>
<td>Developing a procedure to bill students for materials used in project construction</td>
<td>3.64</td>
<td>0.88</td>
<td>3.77</td>
<td>0.90</td>
</tr>
<tr>
<td>Diagnosing malfunctioning agricultural mechanics lab equipment</td>
<td>3.48</td>
<td>0.62</td>
<td>3.60</td>
<td>0.79</td>
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<tr>
<td>Recognizing characteristics of quality tools/equipment</td>
<td>3.75</td>
<td>0.71</td>
<td>3.87</td>
<td>0.85</td>
</tr>
<tr>
<td>Developing educational projects/activities for students</td>
<td>3.51</td>
<td>0.73</td>
<td>3.62</td>
<td>0.88</td>
</tr>
<tr>
<td>Performing routine maintenance of agricultural mechanics lab equipment</td>
<td>3.73</td>
<td>0.75</td>
<td>3.83</td>
<td>0.92</td>
</tr>
<tr>
<td>Constructing welding booths, work benches, storage areas, etc.</td>
<td>3.80</td>
<td>0.70</td>
<td>3.88</td>
<td>0.88</td>
</tr>
<tr>
<td>Inventorying shop tools, equipment and consumable supplies</td>
<td>3.75</td>
<td>0.84</td>
<td>3.82</td>
<td>0.80</td>
</tr>
<tr>
<td>Making agricultural mechanics lab equipment repairs</td>
<td>3.32</td>
<td>0.93</td>
<td>3.40</td>
<td>1.10</td>
</tr>
<tr>
<td>Utilizing technical manuals to order replacement/repair parts for agricultural mechanics lab equipment</td>
<td>3.70</td>
<td>0.86</td>
<td>3.76</td>
<td>0.92</td>
</tr>
<tr>
<td>Updating agricultural mechanics course offerings</td>
<td>3.39</td>
<td>0.75</td>
<td>3.43</td>
<td>0.88</td>
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<tr>
<td>Silhouetting tool/equipment cabinets</td>
<td>3.32</td>
<td>0.99</td>
<td>3.35</td>
<td>0.94</td>
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<tr>
<td>Properly installing and maintaining safety devices and emergency equipment</td>
<td>3.90</td>
<td>0.80</td>
<td>3.89</td>
<td>0.82</td>
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<td>Making minor repairs to the agricultural mechanics laboratory facility</td>
<td>3.52</td>
<td>0.92</td>
<td>3.48</td>
<td>0.98</td>
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<td>Maintaining healthy environmental conditions in the laboratory</td>
<td>3.66</td>
<td>0.86</td>
<td>3.63</td>
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<td>Installing stationary power equipment</td>
<td>3.52</td>
<td>0.84</td>
<td>3.49</td>
<td>0.96</td>
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<td>Developing an identification system to deter tool/equipment theft</td>
<td>3.53</td>
<td>0.90</td>
<td>3.45</td>
<td>0.89</td>
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(Table 3 continues)
(Table 3 continued)

<table>
<thead>
<tr>
<th>Competencies</th>
<th>1989</th>
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<th>2008</th>
<th></th>
<th>Cohen’s d</th>
<th>%Δ</th>
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<tr>
<td>Developing procedures to facilitate the storage/checkout/ security of tools/equipment repairs</td>
<td>3.36</td>
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<td>3.26</td>
<td>0.80</td>
<td>0.12</td>
<td>-3</td>
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<tr>
<td>Making minor agricultural mechanics lab equipment repairs</td>
<td>4.06</td>
<td>0.79</td>
<td>3.84</td>
<td>0.96</td>
<td>0.26</td>
<td>-5</td>
</tr>
</tbody>
</table>

Note. Scale: 1 = no ability, 2 = below average ability, 3 = average ability, 4 = above average ability and 5 = exceptional ability. Relative size of Cohen’s d: negligible effect ≥ -0.15 to < .15; small effect ≥ .15 to < .40; medium effect ≥ .40 to < .75; large effect ≥ .75 to < 1.10; very large effect ≥ 1.10 to < 1.45; huge effect > 1.45. Relative Size of percent change: huge decrease < -75; very large decrease ≤ -50 and > -75; large decrease ≤ -30 and > -50; medium decrease ≤ -15 and > -30; small decrease ≤ -5 and > -15; negligible change ≥ -5 and < 5; small increase ≥ 5 and < 15; medium increase ≥ 15 and < 30; large increase ≥ 30 and < 50; very large increase ≥ 50 and < 75; huge increase > 75.

Conclusions/Implications/Recommendations

School-based agricultural mechanics teachers in Missouri, on average had more years of teaching experience in 2008 than their predecessors in 1989. Conversely, the number of university semester credit hours of agricultural mechanics coursework received during preservice education has decreased. Although slightly reduced, school-based agricultural mechanics teachers continued to devote more than 11 hours per week, on average, to agricultural mechanics laboratory instruction. Larger class sizes and smaller agricultural mechanics laboratory size resulted in a reduced amount of space per student. On average, budgets increased; however, budgets varied greatly in 1989 and 2008. In 1989, the average agricultural mechanics consumable supply budget was $2,426; in 2008 the average budget increased to $2,900. Although the average budget increased between 1989 and 2008, by nearly $500, the average agricultural mechanics consumable supply budget would have needed to increase to $4,349, to account for the 2.82% annual inflation over the nearly 20 year period—an increase of $1,923 to account for inflation alone (Dollar-Times, 2010), rather than $500. Therefore, the increased amount of average budgets is misleading and concerning given the increased number of students enrolled.

Twenty-two of the 33 agricultural mechanics laboratory management competencies had a negligible percent change in perceived importance between 1989 and 2008. Similarly, the percent change in perceived ability of school-based agriculture teachers to perform agricultural mechanics laboratory management competencies between 1989 and 2008 was also negligible for 21 of the 33 competencies. The greatest increases in percent change in perceived ability to perform agricultural mechanics laboratory management competencies were related to development, writing, and planning; arguably, competencies that can be classified as core laboratory management skills and knowledge.

Conversely, the second, third, and fourth greatest increases in percent change in perceived ability to complete agricultural mechanics laboratory management competencies require applied skills or knowledge of applied practices. Arguably, if school-based agriculture teachers who manage an agricultural mechanics laboratory are receiving less pre-service agricultural mechanics preparation, teaching in laboratories with more students who are allotted less space, accidents are more likely to occur. Therefore, we recommend that professional development opportunities be developed and offered to teachers in Missouri who manage these specialized laboratories in the areas of the most need: Safety, including administering first aid, OSHA laboratory safety standards, repairing and maintaining tools, and equipment that function safely for student use.

The National Research Agenda, Priority 3, suggested that “a sufficient supply of well-prepared agricultural scientists and professionals drive sustainable growth, scientific discovery, and innovation in public, private, and academic settings” (Doerfert, 2011, p. 18). These professionals include school-based agriculture teachers.
who must possess essential knowledge and skills in order to help aid in the development of a future workforce who can address societal and industry challenges (Doerfert, 2011). As society looks toward the future, it is imperative that “individuals must be well prepared for discovery science, teaching and learning, science, technology, engineering, and mathematics (STEM) integration…” (Doerfert, 2011, p.18). Acknowledging a review of literature, we recommend professional development opportunities be offered that not only aid school-based agricultural educators in acquiring the knowledge and skills needed to manage an agricultural mechanics laboratory but also in preparing a future workforce. Multiple in-service opportunities should be developed with the professional in mind, i.e., offering workshops that meet the scheduling needs of teachers and those that have high impacts on academic and career and technology skill acquisition for student learners. We further recommend a diverse array of professional development topics be offered including workforce development, safety, and STEM integration. Specifically, workshops designed to teach educators about the best practices for instructing STEM competencies to student learners within the various agricultural education curriculums currently found in many states. Many STEM integrated concepts are relevant to agricultural mechanics and can be instructed in a laboratory setting.

According to Osborne (2007), “well designed professional development experiences, based upon teacher career stage, may improve teacher retention and program continuity” (p. 20). Additionally, literature suggests that “practicing teachers must have continuing access to high quality professional development programs” (Osborne, p. 20). Acknowledging the work of Osborne and others (Barrick et al., 1983; Birkenholz & Harbstreit, 1987; Saucier et al., 2008; Saucier et al., 2009), we recommend that a longitudinal study of pre-service and in-service secondary agriculture teachers’ perceived importance of agricultural mechanics laboratory management competencies and their ability to perform the competencies would provide teacher education programs “an additional gauge of the adequacy of agricultural mechanics curriculum in their pre-service teacher education program” (McKim & Saucier, 2011, p.84). Moreover, studies similar to this one should be conducted periodically in each state to ensure that the continuing education needs of teachers are met in the area of laboratory management and preparing a future workforce.

Recognizing that knowledge and technology related to agricultural mechanics constantly evolves and the average years of teaching experience of Missouri agriculture teachers is only 12 years, we recommend that a comprehensive assessment of professional development be conducted in each state, every five years, to address teacher professional development needs. Furthermore, these opportunities should be tailored for teachers based upon career stage, sex, location, and be facilitated by state supervisory staff or teacher educators and delivered by experienced teachers or industry professionals. These workshops should be delivered around the state of Missouri at local high schools and university campuses during times of the year that are convenient for teachers—summer, winter break, and during the annual teacher professional development conference. If the overall goal of education is to aid in the development of a future workforce that can meet the needs of 21st century employers, industry professional development partnerships should be investigated to determine if industry-delivered workshops (e.g., Lincoln Electric welding workshop, Stihl or Briggs and Stratton small gas engine workshop, CASE Institute) can also adequately meet the in-service needs of school-based agriculture teachers.

As a result of this study and other recent studies in Missouri, state-funded professional development staff have offered both centralized and regional professional development opportunities to teachers in the area of agricultural mechanics skill acquisition, i.e., agricultural electrification, and laboratory management. These workshops have been offered at the various post-secondary institutions in Missouri, at local high schools, and at the summer teachers’ conference. A continued effort is needed in Missouri to meet the ever growing demands of teachers through 21st-century professional development opportunities.
References


**BILLY R. MCKIM** is an Assistant Professor in the Department of Agricultural Leadership, Education, and Communications at Texas A&M University, 2116 TAMU, College Station, TX 77843-2116, brmckim@tamu.edu

**P. RYAN SAUCIER** is an Assistant Professor of Agricultural Education/ Agricultural Systems Management in the Department of Agriculture at Texas State University-San Marcos, 601 University Drive, San Marcos, TX 78666, ryansaucier@txstate.edu
Two Decades of Agricultural Literacy Research: A Synthesis of the Literature

Kristin A. Kovar
Anna L. Ball
University of Missouri

The purpose of this investigation was to identify and synthesize research related to agricultural literacy since the publication of Understanding Agriculture—New Directions for Education (1988). The researchers sought to determine where agricultural literacy research was published, which populations were targeted, the purpose of the research, and the findings of agricultural literacy studies published between 1988 and 2011. Overall, a total of 49 studies were found: 17 studies in the Journal of Agricultural Education, seven studies in the NACTA Journal, three studies in the Journal of Extension, 18 studies in national or regional American Association for Agricultural Education (AAAE) conference proceedings, and four miscellaneous studies. The populations targeted in agricultural literacy research were teachers, students, and non-educator adults with elementary teachers and students being the most frequently targeted populations. The purposes of the respective studies were coded into three specific areas: (a) assess agricultural literacy; (b) test the effectiveness of an agricultural literacy program; or (c) develop a framework or guide used to assist educators. While the programs were found to be successful in increasing agricultural literacy, many populations assessed were found to be agriculturally illiterate. Further research is warranted to explain areas of deficiency in agricultural literacy.

Keywords: agricultural literacy; research synthesis

“As our global population grows to a projected nine billion people by 2050, the non-agriculture population has little to no understanding of the complexities involved with sustaining a viable agriculture system” (Doerfert, 2011, p. 8). With a steady increase in the planet’s population, changes affecting agriculture are occurring such as increased production needs, widespread urbanization, and regulation and policy changes. The National Research Agenda for the American Association of Agricultural Education (AAAE) outlines six key research priority areas. Research priority one is “Public and Policy Maker Understanding of Agriculture and Natural Resources” (Doerfert, 2011). The emphasis placed on understanding agriculture in a modern world through research priority one communicates the need for an agriculturally literate society. Agricultural literacy is defined as an “understanding of the food and fiber system [that] includes its history and current economic, social, and environmental significance to all Americans” (National Research Council (NRC), 1988, p. 1).

With fewer people directly involved in production agriculture and the complexity of agricultural issues presented to legislatures, the need for an agriculturally literate society is imperative so that informed individuals are able to make educated decisions regarding agriculture (Pope, 1990). The steady rise of urbanization has transferred the future of agriculture to a group of people with an overwhelming lack of support for agricultural issues. Agriculturally literate Americans are more likely to support policies affecting agriculture than those Americans lacking agricultural literacy (Ryan & Lockaby, 1996).

Controversy in agriculture has continued to increase over the years due to genetically modified crops, animal rights, and food safety issues (Leising, Igo, Heald, Hubert, Yamamoto, 1998). Organizations and special interest groups have attacked the agricultural industry using the guise of creating an “informed public.” An
Agriculturally literate population is able to see beyond emotional pleas and make informed decisions on these issues. A society with an understanding of agriculture and current economic, social, and environmental impacts could lessen current challenges facing agriculture through good decision making along with providing the necessary support.

Research efforts in agricultural literacy began after a publication by The National Research Council in September of 1988 entitled *Understanding Agriculture—New Directions for Education* (1988). This report was the result of a study initiated in 1985 due to concerns about the diminishing profitability of American agriculture and the decrease of agricultural education enrollments in secondary schools. At the request of U.S. Secretaries of Agriculture and Education, the National Research Council established the Committee on Agricultural Education in Secondary Schools to assess the contributions of agricultural instruction on the economic impact of U.S. agricultural production (Frick, Kahler, & Miller, 1991). Upon publication of *Understanding Agriculture—New Directions for Education* (1988), research on the concept of agricultural literacy began and has continued throughout the last 23 years.

Publication of *Understanding Agriculture—New Directions for Education* (1988) sparked many changes in the management and operation of agricultural education programs in secondary schools. The publication stressed the establishment of programs in urban and suburban settings as well as a broadening of agricultural instruction. It also motivated a change in exclusivity by removing terms such as vocational, straying from traditional boundaries and attracting students of diverse interests. Aligning curriculum with science-based instruction methods and promoting a goal of increased program ethnic diversity was also encouraged (NRC, 1988).

Agriculture as a whole has changed drastically since the publication of *Understanding Agriculture—New Directions for Education* (1988). The agricultural industry went through extremely trying times and financial crises in the 1980s, as evident in the dramatic rise of interest rates peaking over 20 percent, as well as a high debt-to-asset ratio (Boehlje & Hurt, 2008). Financial issues are still a concern in current times, but with agricultural loans at a much lower 4.5 percent and a significantly lower debt-to-asset ratio across the industry, agriculture is in a more secure position than it was in the 1980s. Another change is the rise of corporate farming resulting in fewer people involved in production agriculture. As agriculture changed drastically over the years, one would expect to see a change in how society understands agriculture as well.

Over the last two decades, the core concept of agricultural literacy, the understanding of agriculture, has stayed the same. However, understanding agriculture in 1988 and understanding agriculture in 2012 are two vastly different concepts. The change in technology alone warrants a new framework in which to examine agricultural literacy. Other changes include organic farming, ethanol production, international trade, buying local, environmental stewardship and climate, genetically modified organisms, as well as many other trends in agriculture. Agricultural educators designed programs to increase agricultural literacy prior to the publication of *Understanding Agriculture—New Directions for Education* (1988), but society is still considered agriculturally illiterate. If the concepts of agricultural literacy have evolved, but is being assessed through traditional methods, is the understanding of agriculture truly being evaluated?

**Purpose**

As seen in the most recent AAAE National Research Agenda priority areas, agricultural literacy is still an concern in the agricultural education discipline. There is a need to summarize and synthesize agricultural literacy research to determine if the attempts made in creating agriculturally literate populations were successful and determine what has been learned about agricultural literacy in the last two decades. Synthesizing the findings of agricultural literacy research may highlight where the research has been and where it needs to go in the future.

The purpose of this investigation was to identify and synthesize research related to agricultural literacy since the publication of *Understanding Agriculture—New Directions for Education*
Based on this purpose, the following research questions were developed:

1. What studies were conducted in agricultural education regarding agricultural literacy?
2. What populations were targeted in agricultural literacy research?
3. What was the purpose of agricultural literacy research?
4. What findings and recommendations were suggested based on a summary of the agricultural literacy research?

**Methods/Procedures**

The design for this study was a research synthesis. A synthesis of research is beneficial by gathering “trustworthy accounts that accumulate past research [which aids in] knowledge building” (Cooper, 2010, p.1). Building knowledge of the result of 23 years of agricultural literacy research is a needed task for the benefit of not only agricultural education, but the global industry of agriculture as well. The search and inclusion criteria utilized three essential strategies for rigor in research syntheses including search strategies, inclusion criteria, and coding (Cooper, 2010). Specific strategies incorporated an exhaustive search of library databases, such as ERIC and PsychINFO, along with Google Scholar and journal websites. Keywords and phrases included in the search were “agricult* literacy” and “agricult* education”. Articles containing agricultural literacy research were documented and saved for analysis.

The publication of *Understanding Agriculture—New Directions for Education* (1988) was selected as the parameter for this search given the focus placed on agricultural literacy, introducing the concept into agricultural education research. Establishing inclusion criteria prior to the literature search is necessary in maintaining rigorous synthesis methods (Cooper, 2010).

Inclusion criteria for this study were developed *a priori* and contained articles meeting the following specifications: (a) published in AAAE research conference proceedings (regional or national); (b) published in a peer-reviewed research journal; (c) included specific agricultural literacy terminology within the article; (d) available and accessible through search procedures; and (e) published between October 1988 and August 2011. Duplications of research, as well as studies not specifically using agricultural literacy terminology were excluded from the synthesis. Forty-nine studies met the inclusion criteria.

The majority of the 49 resulting studies were retrieved from the following data sources: (a) AAAE research conference proceedings (regional and national), (b) *Journal of Agricultural Education*, (c) *Journal of Extension*, and (d) *NACTA Journal*. A final category of (e) other included additional studies retrieved through the online search of agricultural literacy resources. Cooper (2010) suggests the use of a coding guide when examining a large number of studies. From this, 49 articles were organized and summarized into a matrix identifying the following characteristics: (a) article title, author(s), and year; (b) participants and sample size; (c) purpose of the study; (d) specific objectives; and (e) findings and conclusions. The matrix was beneficial in coding the data into emergent themes.

A single coder was responsible for finding and coding all agricultural literacy research. Reliability of coding was established through peer debriefs. According to Creswell (2007), peer debriefing provides an external check of the research process and asks hard questions about methods, meanings, and interpretations. Debriefing occurred at multiple stages of the study, including the analysis of the findings. Every research study meeting the inclusion criteria was compared and categorized based on similarities which organized the data into logical groups. Findings then guided the development of conclusions, implications, and recommendations.
Findings

Research Question One: What studies were conducted in agricultural education regarding agricultural literacy?

For research question one, the researchers sought to determine the location of studies within agricultural education research regarding agricultural literacy after the publication of Understanding Agriculture—New Directions for Education (1988). Forty-nine studies were identified through an exhaustive search that met the inclusion criteria (see Table 1).

Table 1
Location of Agricultural Literacy Research Publication, 1988-2011 (n=49)*

<table>
<thead>
<tr>
<th>Year</th>
<th>JAE</th>
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<th>JOE</th>
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<td>17</td>
<td>7</td>
<td>3</td>
<td>18</td>
<td>45</td>
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</tbody>
</table>

*Note: Four articles were found in miscellaneous journals. This category will be referred to as “other.”

Table 1 displays the number of studies published in the Journal of Agricultural Education, the NACTA Journal, Journal of Extension, or AAAE Conference Proceedings (national and regional). Beyond the four main categories, an “other” category was utilized to identify miscellaneous studies. There were no studies found on agricultural literacy in 1988 or 1989. All other years contained between one and four studies published within the year. The years 1994 and 1999 contained the highest number of studies published, four in each year. Overall, a total of 17 studies were found in the Journal of Agricultural Education, seven studies in the NACTA Journal, three studies in the Journal of Extension, 18 studies in national or regional conference proceedings, and four miscellaneous studies were identified. Other sources offering agricultural literacy research included California Agriculture, the Texas Journal of Agriculture and Natural Resources, and Water, Air, and Soil Pollution.
Research Question Two: What populations were targeted in agricultural literacy research?

For research question two, the researchers sought to identify the target populations in agricultural literacy research after the publication of Understanding Agriculture—New Directions for Education (1988). Initial examination of the research, included a designation of population, which led to three emergent themes for the types of research populations targeted. The populations were then coded based on the themes into (a) teachers, (b) students, and (c) non-educator adults (see Table 2).

Table 2

| Participant Groups Included in Agricultural Literacy Research, 1988-2011 (n=49) |
|---------------------------------|-----------------|
| **Target population**          | **Frequency**   |
| Teachers                        |                 |
| Elementary                      | 4               |
| High School                     | 2               |
| K-12                            | 4               |
| Students                        |                 |
| Elementary                      | 15              |
| Middle School                   | 4               |
| High School                     | 5               |
| K-12                            | 2               |
| College                         | 3               |
| 4-H member                      | 4               |
| Non-educator adults             |                 |
| Community members               | 6               |
| **Total**                       | 49              |

Table 2 displays the frequency of participant groups utilized in the targeted research population. Teachers were coded as elementary teachers, high school teachers, or K-12 teachers. The highest frequencies of teachers studied were elementary and K-12 teachers. Examples of agricultural literacy research with elementary teacher participant groups included Terry, Herring, and Larke (1992) and Bellah and Dyer (2007). Terry et al. assessed fourth grade teachers’ understanding and use of agricultural concepts in their classroom to determine if assistance was needed to implement agricultural literacy programs. Bellah and Dyer (2007) described elementary teachers’ attitudes and perceptions of agriculture after completing a preservice agricultural literacy awareness course.

Students were coded as elementary students, middle school students, high school students, K-12 students, college students, or 4-H members/students. The highest frequency of studies targeted elementary students. One study involving an elementary student population was conducted by Meischen and Trexler (2003) in which they interviewed rural elementary students to determine students’ understandings of agriculture specifically related to meat and livestock.

Non-educator adults were coded as community members and included parents, officials, administrators, or other community leaders. Examples of studies focused on assessing agricultural literacy of non-educator adults included Wearly, Frick, and Shelhamer (1999) and Braverman and Rilla (1991). Wearly et al. assessed the agricultural knowledge of elected officials in Montana’s 54th legislative session. Braverman and Rilla (1991) determined the agricultural views of three main stakeholder groups: county school superintendents, county career education directors, and school district superintendents.

Research Question Three: What was the purpose of agricultural literacy research?

For research question three, the researchers sought to identify the purpose of the agricultural literacy research as indicated by the author(s) of the study. Studies were coded based on one of three themes: (a) assessing agricultural literacy, (b) testing a program or (c) the development of a framework or guide (see Figure 1). The studies assessing agricultural literacy were determining the agricultural knowledge of a specific population. The studies testing a program were determining the success of programs used to disseminate agricultural literacy. The studies developing a framework or guide were creating either a list of competencies or a conceptual model for the improvement of agricultural literacy in a population, typically as a guide for classroom teachers.
Figure 1 displays the frequency of studies in each category of purpose as identified by the study. Of the 49 total studies found, 23 were identified with the purpose of assessing agricultural literacy. Specifically, those studies that sought to assess agricultural literacy identified the purpose of “determining understanding.” An example of research with the purpose of assessing agricultural literacy was a study of Southeast Missouri State University students designed to determine their knowledge and perceptions of issues related to agriculture, food, and the environment (Birkenholtz, Harris, & Pry, 1994).

Nineteen studies were identified that tested the effectiveness of an agricultural literacy program. The studies testing a program typically compared a control and treatment group or gave pre- and post-tests to determine knowledge gained. Programs tested included Ag in the Classroom (Pense, Leising, Portillo & Igo, 2005), AgVenture Magazine (Swortzel, 1997), Food, Land, and People lessons (Powell & Agnew, 2011), and Summer Agricultural Institute (Balschweid, Thompson, & Cole, 1998).

Seven studies were identified with the purpose of developing a framework or guide. These studies typically had a goal of developing a tool to guide and assist educators in teaching agricultural content (Frick, 1993; Hubert et al. 2000; Powell, Agnew, & Trexler, 2008). A study by Frick (1993) determined agricultural literacy subject areas to constitute a framework of a middle school agricultural education core curriculum. Hubert, Frank, and Igo (2000) sought to heighten awareness of a developed framework to improve food and fiber literacy in K-12 students. Powell et al. (2008) examined three approaches to agricultural literacy curriculum development, implementation, and assessment: inductive, deductive, and evaluative. They developed a conceptual model for agricultural literacy by examining multiple models.

Research Question Four: What findings and recommendations were suggested based on a summary of the agricultural literacy research?

For research question four, the researchers sought to examine the findings and recommendations of agricultural literacy research in order to guide or suggest directions for future research. Findings for the agricultural literacy research studies were in line with the specific purposes of the studies, which were to assess agricultural literacy of a population, test the effectiveness of an agricultural literacy program, or develop a framework or guide to assist...
teachers in the dissemination of agricultural literacy content.

**Agricultural literacy assessment**

Findings of the research studies in this synthesis focused on agricultural literacy assessment were coded as the populations being either agriculturally literate, possessing some agricultural knowledge, or agriculturally illiterate. A total of 23 studies had the goal of assessing agricultural literacy.

Six studies found participant groups (high school teachers, non-educator adults, and college students) to be agriculturally literate. For example, a study by Harris and Birkenholtz (1996) found that the secondary educator groups were knowledgeable about agriculture and had positive attitudes toward the agriculture industry. In another study, researchers found that elected officials in Montana’s 54th legislative session had positive perceptions of agriculture (Wearly et al. 1999).

Ten studies found participant groups (elementary students, middle school students, high school students, and non-educator adults) possessed some knowledge of agriculture. A study by Pense and Leising (2004) found both Oklahoma high school agricultural education and general education students possessed some agricultural knowledge and that the two groups did not differ in their levels of overall knowledge of agriculture. They also found that students from rural schools were less knowledgeable about agriculture than students attending urban or suburban schools.

Six studies found participant groups (elementary students, elementary teachers, and college students) to be agriculturally illiterate. For example, Hess and Trexler (2011) found informants lacked essential sub-concepts of agriculture that prevented them from developing schema needed for understanding agricultural benchmarks. Terry et al. (1992) found that a majority of teachers in Texas taught agricultural concepts in their classrooms, but had inaccurate perceptions of and limited knowledge of agriculture.

The remaining study by Colbath and Morris (2010) compared agricultural literacy in two groups. The researchers found after assessing a group of college freshmen that suburban students had the highest scores on agricultural literacy assessments when compared to rural and urban students. Comparing the agricultural literacy among groups allowed researchers to determine areas of weakness among populations and to identify where efforts should be focused in order to increase agricultural knowledge.

**Program testing**

A total of 19 studies tested the effectiveness of agricultural literacy programs. All studies revealed increases in understanding of agriculture among participants, but with varying levels of effectiveness. Some studies reported a higher program impact on agricultural literacy than others.

Findings of agricultural literacy research focused on program testing indicated materials or program utilized were effective in increasing agricultural competency. In a study assessing the program Ag in the Classroom by Pense et al. (2005), findings indicated Ag in the Classroom programs made positive differences in the K-6 student acquisition of knowledge about agriculture. *California Agriculture* published a research article by Rilla, Desmond, Braverman, Ponzio, Lee, Sandlin, & Kaney (1991) that assessed several agricultural literacy programs across California. Their findings indicated that there were four key components in order to have a successful agricultural literacy program. They were a dedicated, visionary leader, high levels of commitment from staff and administrators, a strong link between agricultural literacy education and classroom-based learning and adequate (material) resources. Monk, Norwood, and Guthrie (2000) found that observing a live cow milking demonstration greatly improved fourth grade students’ knowledge and understanding of the dairy industry. Finally, Mabie and Baker (1996) studied three groups of inner-city, minority, fifth- and sixth-grade students in Los Angeles, California. The groups were randomly assigned into the following treatments: (a) a ten-week garden project; (b) a ten-week series of in-class projects of bread baking, chick rearing, and seed germination; and (c) a control group that received no treatment. This study found that while the students had very little knowledge of
the food and fiber system prior to the treatments, their knowledge increased by participating in the activities.

**Development of framework or guide**

Seven studies were conducted with the purpose of developing a framework or guide. Three of those studies developed a framework for the purpose of identifying competencies necessary for the attainment of agricultural literacy. Two studies developed a conceptual model for examining agricultural literacy. The remaining two studies developed a guide for teachers to use to educate students about agriculture. Specifically, one of these two studies identified topics that constituted the core curriculum for a middle school agriculture program (Frick, 1993).

Findings of agricultural literacy research focused on developing a framework or guide indicated creating this framework was beneficial in determining content for agricultural literacy instruction. An earlier study by Frick et al. (1991) established eleven agricultural subject areas needed to achieve agricultural literacy. The eleven areas were 1) relationship with the environment, 2) agricultural processing, 3) public policies, 4) relationship with natural resources, 5) animal products, 6) societal significance, 7) plant products, 8) economic impact, 9) agriculture marketing, 10) distribution, and 11) global significance. The researchers then recommended that the eleven broad areas should be used in agricultural education curricula reform to increase agricultural literacy in K12, elementary, middle, and high schools.

**Conclusions/Implications/Recommendations**

Based on the findings in this study, it could be concluded that a majority of agricultural literacy studies have been published in the Journal of Agricultural Education and American Association for Agricultural Education conferences (national and regional) as compared to the Journal of Extension, the NACTA Journal and other sources. This implies that as a discipline, the field of agricultural education has mainly published within the field of agricultural education and has not ventured into other fields and venues. It is important to note that the studies included in this synthesis are limited by terminology in that only articles explicating the agricultural literacy terminology were included. Perhaps disciplines outside of agricultural education use different terminology in their research of agricultural literacy. Without this exception, a larger quantity of studies outside the discipline of agricultural education would indicate an expansion on the focus of agricultural literacy to broader audiences. According to Williams, “Research is of limited value unless the findings are made available to other researchers and practitioners” (1991, p. 20). Therefore, it is recommended that agricultural education researchers place a high priority on publishing research utilizing specific agricultural literacy terminology in non-agricultural education venues to increase knowledge of agricultural literacy outside the field of agricultural education and to market their findings.

It is further concluded that the populations most frequently targeted in agricultural literacy research are elementary teachers and students. The reasoning behind this may be traced back to an important statement extensively cited from Understanding Agriculture—New Directions for Education (1988). It states, “Agriculture—broadly defined- is too important a topic to be taught only to the relatively small percentage of students considering careers in agriculture and pursuing vocational agriculture studies” (NRC, 1988, p. 8). After the publication of Understanding Agriculture—New Directions for Education (1988), there was an increase in educating elementary students about agriculture, as well as focusing on elementary education participants in agricultural literacy studies. The major issue with targeting young audiences is to do so potentially excludes older audiences capable of directly impacting complex issues and policy decisions. According to Igo and Frick (1999), a well-informed, agriculturally literate society is needed for the continued success of the U. S. agriculture industry. Recommendations of the synthesis include expanding the focus of agricultural literacy research beyond elementary teachers and students. Examining high school teachers and students, as well as community members and leaders on a more frequent basis would better
indicate the number of agriculturally literate individuals making impactful decisions.

Further, it is concluded that the two main purposes for agricultural literacy research are to assess the agricultural literacy of a population or test an agricultural literacy program for effectiveness. These conclusions imply that assessing the agricultural literacy of a population and determining the effectiveness of a program are important goals in order to determine the next steps in agricultural literacy education. Together, the findings and recommendations of studies assessing literacy programs, as well as the agricultural competency of populations indicate the programs were successful in disseminating agricultural literacy, but many populations are still agriculturally illiterate. Perhaps, the agriculturally illiterate populations are simply not being reached by the efforts of agricultural literacy programs. Baseline data are needed to ascertain what students are learning about agriculture to provide key indicators of progress being made toward the achievement of program goals (Pense et al. 2005). It is recommended that researchers continue assessing the understanding of agriculture in all populations to determine weak areas in need of further intervention. Researchers should also continue testing programs for agricultural literacy effectiveness while also expanding the types of programs tested and the populations included in the programs.

Finally, it is concluded that when assessing populations, people are either agriculturally literate, possessing some knowledge of agriculture, or agriculturally illiterate. While assessing agricultural literacy, populations were also compared to determine areas of weakness. When testing a program, the findings indicate the materials or program were successful in increasing agricultural literacy. These findings may point to a disconnect between successful agricultural literacy programs and an agriculturally illiterate society. This could be due to programs not reaching a majority of people, or it could be that these programs are mostly operated on small scales in a specific states, towns, or even classrooms. According to Jepsen, Pastor, and Elliot (2007), most efforts to increase agricultural literacy through specific programs are intermittent, at best. If more programs were national in scope, such as Ag in the Classroom, more people across the country could be included in the program. These findings indicate researchers are assessing populations’ knowledge of agriculture, as well as assessing the materials and programs used to increase agricultural literacy in a variety of populations, but that the programs are not reaching a large portion of the population. It is recommended that researchers continue to assess populations and programs while increasing the variety of populations and programs assessed. Researchers should also identify areas of deficiency in research related to agricultural literacy efforts and continue these efforts in the future.

Agricultural literacy is a current issue, not only in American society, but globally. Knowledge and understanding of agriculture is necessary as the global population expands creating compounding issues of feeding the world, while establishing and maintaining a sustainable, viable agriculture system.

References


KOVAR & HENRY

Two Decades of Agricultural…

Kovar & Henry

Notice of Correction

Anna L. Ball was originally listed as Anna L. Henry in the author’s line on this manuscript. This correction has been made in all online references to this paper as of March 27, 2013.
Assessing the Impact of a Semester-long Course in Agricultural Mechanics on Pre-service Agricultural Education Teachers’ Importance, Confidence, and Knowledge of Welding

Brian L. Leiby
Marionville, MO
J. Shane Robinson
James P. Key
Oklahoma State University

This study sought to assess the perceptions of Oklahoma pre-service agricultural education teachers regarding the importance of identified welding skills standards and their confidence to teach them, based on a semester-long course on metals and welding. This study also sought to determine pre-service teachers’ knowledge of welding prior to and at the end of instruction. It was found that pre-service teachers rated the seven constructs above average in importance; yet, they had below average confidence in their abilities to teach them at the beginning of the semester and between average and above average confidence at the end of the semester, which resulted in large practical effect sizes. Further, they increased their knowledge score from an F at the beginning of the semester to a C at the end of the semester, which was both statistically and practically significant. These pre-service teachers should be followed, longitudinally, to determine if and when they are able to fully master the skills and teach them effectively in the classroom and laboratory settings. Because agricultural mechanics is a vast field, future research should assess pre-service teachers’ perceived levels of importance and confidence in areas outside of welding, such as electricity, plumbing, and small gas engines.

Keywords: pre-service agriculture teachers; agricultural mechanics; human capital; competencies

With the restricting degree plans at a maximum of 128 total credit hours, teacher preparation programs find it difficult to include enough technical competency preparation for pre-service teachers (Burris, Robinson, & Terry, Jr., 2005; Robinson, Krysher, Haynes, & Edwards, 2010). Providing secondary students with adequate opportunities to acquire necessary technical competencies in agriculture is challenging, especially when considering the subject of agricultural mechanics (Burris et al., 2005).

Dillard (1991) stated that it can be difficult to produce prepared teachers of agricultural mechanics with a minimum requirement of seven credit hours. Currently, Oklahoma State University (OSU) requires only five credit hours in agricultural mechanics coursework. As such, a need exists to determine if the current agricultural mechanics coursework at OSU is meeting the needs of its pre-service agricultural education teachers, as they will likely be expected to teach it once they enter the profession.

Agricultural mechanics is a science-based curriculum that provides teachers with opportunities to integrate concepts of physics, chemistry, and mathematics (Miller, 1991). “Agricultural mechanics traditionally has been a cornerstone in the secondary program” (Burris et al., 2005, p. 23). As noted in 2009, 59 percent of the United States’ eleven thousand agricultural education instructors teach agricultural mechanics at their local school system (National FFA Organization, 2010). Therefore, ensuring that instructors are prepared to teach agricultural mechanics is critical.
Teacher preparation programs should focus on providing a high level of technical skill training in agricultural mechanics and strive to increase students’ confidence to teach it effectively because producing and retaining highly qualified teachers is imperative to the success of the United States as a country (Wallis, 2008). Kennel (2009) stated, “because teachers are the single most important influence on student achievement, teacher education programs need to provide learning experiences for pre-service educators to impact their confidence to teach pertinent subject matter and their perceptions of its importance” (p. 2). Unfortunately, not all entry-level teaching graduates are ready to assume the responsibilities of professional work roles (Levine, 2005). Therefore, preparation programs should take heed and strive to ensure its graduates are ready for employment.

Agricultural education is designed to be industry-validated as it strives to equip students with the skills, education, and training necessary to be successful in industry and post-secondary education (Roberts & Ball, 2009). Therefore, teachers should be competent at teaching all agricultural subject areas (Robinson et al., 2010) and strive to “link the teaching of academic subjects to real-world applications” (Carnevale, Gainer, & Villet, 1990, p. 237). To link education to the real-world, various states take different approaches. The state of Oklahoma has implemented skills standards for various subjects to help close the gap between the classroom and the workplace.

Skills standards provide the foundation for competency-based instruction in Oklahoma’s Career Tech system. The skills standards outline the knowledge, skills and abilities needed to perform related jobs within an industry. Skills standards are aligned with national skills standards; therefore, a student trained to the skills standards, possesses technical skills that make him/her employable in both state and national job markets. (Oklahoma Department of Career and Technology Education (ODCTE), OD46903, 2006, p. A)

Competent, qualified teachers are the backbone of high quality instruction at any level. Highly qualified teachers are those who have gained teacher certification and licensure, know their subject area, and are competent at teaching it (Darling-Hammond & Berry, 2006). Per these requirements, Roberts, Dooley, Harlin, and Murphrey (2006) stated, “competency in subject matter and pedagogy is more subjective and thus more difficult to measure” (p. 1).

In Oklahoma, agricultural education majors must meet three minimal requirements to be qualified to teach. Students must obtain a bachelor’s degree, be granted full certification, and possess proficiency in the subject matter in which they are expected to teach by passing the Oklahoma Subject Area Test (OSAT) (OSU Student Handbook for Agricultural Education & Student Teaching, 2009-2010).


One of the key areas of Agricultural Power and Technology is welding. Oklahoma skills standards for welding were developed by the ODCTE. Welding skills standards pertain to the welding industry, specifically, and to the national welding industry, generally. Oklahoma welding skills standards are aligned with and endorsed by the American Welding Society (AWS). Skills standards provide a listing of necessary skills in which an individual should be proficient to be deemed competent and employable. To ensure that competencies are met, written assessments are used to evaluate student performance (ODCTE, OD46903, 2006). Skills standards provide educators with a roadmap of essential skills they should teach.

Specifically, welding is comprised of seven skills standards. These seven consist of manual arc welding, welding processes and procedures, welding knowledge, welding safety, oxy-fuel, brazing, and manual cutting (ODCTE, 2006). As such, pre-service teachers should be confident in and knowledgeable about these seven skills.
standards. Wingenbach, White, Degenhart, Pannkuk, and Kujawski (2007) stated that, Highly qualified teachers are defined in the No Child Left Behind Act of 2001 (NCLB) as those who not only possess state certification, but who also have content knowledge of the subjects they teach. In Career and Technical Education (CTE), teachers need to be competent in technical, employability, and academic skills. Additionally, high-quality CTE [Career Technical/Workforce Education] teachers are essential in helping the United States develop a 21st-century workforce that will be competitive in the world marketplace. (pp. 114-115)

Conceptually, this study was based on the human capital theory. Human capital (HC) is an investment in people’s knowledge, skills, experiences, competencies (Becker, 1964; Bernston, Sverke, & Marklund, 2006; Garavan, Morley, Bunnigle, & Collins, 2001; Little, 2003; Mincer, 1974; Schultz, 1971; Smith, 2010; Smylie, 1996). The more developed a person’s HC, the more employable that person becomes (Becker, 1975), so long as the HC is a good match, or fit, for the job in which he or she is seeking (Ballout, 2007; Caplan, 1987).

The Oklahoma Commission for Teacher Preparation (OCTP) documents professional examination scores in its program assessment report. In the section designated for OSAT scores, agricultural education pre-service teachers averaged the lowest or second to lowest examination scores in agricultural power and technology from 2002 to 2005 (Leiby, Robinson, Key, & Leising, 2011). Additionally, agricultural education pre-service teachers were most likely to receive failing scores in the area of agricultural power and technology on the OSAT. Below average certification scores, combined with the highest rate of failure in the OSAT area of agricultural power and technology, indicated a need to determine Oklahoma pre-service agricultural education teachers’ knowledge about and confidence to teach skills related to agricultural mechanics.

Purpose of the Study

The purpose of this study was to assess the perceptions of pre-service agricultural education teachers at Oklahoma State University regarding the importance of identified welding skills standards and their confidence to teach them, based on a semester-long course on metals and welding. Further, this study sought to determine pre-service teachers’ knowledge of welding prior to and at the end of instruction. The following research objectives guided the study.

1. Compare pre-service agricultural education teachers’ perceived levels of importance to teach selected welding skill constructs prior to and at the end of instruction.
2. Compare pre-service agricultural education teachers’ perceived levels of confidence to teach selected welding skill constructs prior to and at the end of instruction.
3. Determine the relationship between pre-service agricultural education teachers’ perceived levels of confidence to teach selected welding skills standards and final course grade.
4. Determine the relationship between pre-service agricultural education teachers’ final course grade and level of work experience in welding.
5. Compare pre-service agricultural education teachers’ levels of technical knowledge in welding prior to and at the end of instruction.

Methods

The research design employed for this study was descriptive-correlational. Descriptive statistics (i.e., modes of central tendency and variability) are helpful for summarizing trends (Ary, Jacobs, & Razavieh, 2002). Descriptive statistics assist researchers to understand better the degrees of variation in data and help define relationships among data sets (Creswell, 2008); whereas, “In correlational research designs, investigators use the correlation statistic test to describe and measure the degree of association
(or relationship) between two or more variables or sets of scores” (p. 356).

The instrument used in this study consisted of three sections. Section one was utilized to capture pre-service teachers’ self-perceived confidence and importance ratings on the seven welding skills constructs. Section two was designed to measure the welding knowledge proficiency of pre-service teachers. Finally, section three was employed to gather personal characteristics data from the participants. Measurements of knowledge, confidence, and importance were collected prior to and at the end of instruction via survey research.

Using participants’ responses, the welding education need for pre-service agricultural education teachers was determined. The population for this study was all pre-service agricultural education teachers (N = 58) enrolled in a metals and welding course at Oklahoma State University in Fall 2009. Because this course has been taught for the past 25 years by the same instructor to essentially the same types of students, an assumption was made that these pre-service teachers were no different regarding their demographic makeup, age, work experiences, or knowledge than other pre-service teachers in recent, previous years. So, a time and place sample, as defined by Oliver and Hinkle (1982), was employed serving as justification for the researchers to use inferential statistics.

Descriptive statistics (i.e., means and standard deviations) were employed for objectives one and two. A Cohen’s d statistic was used to measure the practical effect that the constructs had on students’ perceived levels of importance and confidence to teach the skills as a result of the 16-week course. Practical difference is important to assess because it informs the researcher as to whether or not the treatment effect was “large enough to be useful in real world” (Kirk, 1995, p. 64) and was interpreted as .2 = small, .5 = medium, and .8 = large (Cohen, 1988).

A Pearson Product-Moment Correlation was calculated for objectives three and four. The null hypothesis for objective three stated that, in the population studied, there was no relationship between teachers’ final course grade and level of teachers’ prior work experience in welding (Ho: β = 0).

The instrument used for section one was developed by the researchers and consisted of 26 skills which were derived from the ODCTE, OD46903 (2006). Once developed, the instrument was reviewed by a panel of agricultural education faculty for face and content validity. Then, a pilot study was performed on a group of pre-service teachers (N = 23) who were enrolled in the course during the summer semester of 2009. Using Nunally’s (1980) minimum criteria of .70 for reliability, the pilot study results indicated that the instrument was reliable on all seven constructs, with the exception of welding safety importance. That construct had a reliability estimate of .54 (Leiby et al., 2011). However, the welding safety confidence construct had a reliability estimate of .79. Because all other constructs were above Nunally’s (1980) threshold, section one of the instrument was deemed reliable. Once administered, pre-service teachers were asked to rate how important they believed the skills standards were to teaching welding. Secondly, pre-service teachers rated how confident they were at teaching those skills.

Section two was designed to assess welding knowledge via pre-service teachers’ final course grade. As such, a criterion-referenced test was developed by the researchers. In all, 25 questions were developed for the welding knowledge test. These questions were taken directly from notes and a test bank from the instructor of record. Reliability coefficients such as a Cronbach’s alpha are not necessary for establishing reliability of criterion-referenced tests. Instead, Wiersma and Jurs (1990) listed eight factors that researchers should address to improve measurement reliability of criterion-referenced tests.

The following accommodations were made to address the suggestions of Wiersma and Jurs (1990): 1) Homogeneous items: The questions utilized in the design of the test were taken directly from course content or from an established course question bank. All material used for developing the test was cross-referenced with Oklahoma Agricultural Power and Technology and Welding Skills Standards; 2) Dis-
categorizing items: Test questions were analyzed utilizing question difficulty and discrimination scores provided and computed by the Oklahoma State University Testing Center; 3) Enough items: The test consisted of 25 questions on pre-service teachers’ knowledge of welding. In its entirety, the instrument contained 87 questions and was administered twice during the semester (prior to instruction and at the end of instruction). Therefore, the instrument was deemed acceptable in length; 4) High quality copying and format: The test was custom printed professionally by the OSU Testing Center. Sections two and three were printed using laser jet ink mass copying systems. All laser jet ink copies were reviewed, sorted, culled, and reprinted when necessary to provide clean, sharp, and readable copies. All responses were provided on commercially available scantron forms; 5) Clear directions for the students: Oral instructions were developed by the researcher and read aloud to participants before all survey administrations. With the assistance of whiteboard illustrations, the researcher attempted to provide examples of how to complete the test properly. The instructions were provided with the intention of minimizing the rate of student errors and any potential sources of confusion; 6) A controlled setting: Students were allowed time to take the test in the same location in which their laboratory experiences occurred; 7) Motivating instructions: In addition to receiving the oral instructions, pre-service teachers were provided with the intentions of the test and the importance of answering questions accurately and honestly; 8) Clear directions to the scorer: All Scranton® forms were scored and tabulated by the OSU Testing Center. For objective five, an independent samples t-test was run. The null hypothesis stated that, in the population studied, no statistically significant ($p > .05$) difference existed between teachers’ level of technical knowledge of welding before and after instruction (Ho: $\mu_1 = \mu_2$). This study was part of a larger body of work (Leiby et al., 2011), which revealed that those who participated in the study were predominately male (74%) and 22 years of age or older (47%). Greater than one-half (59%) of these pre-service teachers had no formal welding experience prior to enrolling in the course.

### Findings

Objective one was to compare pre-service agricultural education teachers’ perceived levels of importance to teach selected welding skills standards prior to and at the end of instruction. Pre-service teachers experienced positive gains on all seven constructs throughout the semester (see Table 1), as detected by the low, practical effect sizes.

<table>
<thead>
<tr>
<th>Construct</th>
<th>Prior to Instruction$^a$</th>
<th>End of Instruction$^b$</th>
<th>Mean Differences$^c$</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$M$</td>
<td>$SD$</td>
<td>$M$</td>
</tr>
<tr>
<td>Manual Arc Welding</td>
<td>4.21</td>
<td>.89</td>
<td>4.39</td>
</tr>
<tr>
<td>Welding Processes and Procedures</td>
<td>4.38</td>
<td>.72</td>
<td>4.53</td>
</tr>
<tr>
<td>Welding Knowledge</td>
<td>4.37</td>
<td>.73</td>
<td>4.48</td>
</tr>
<tr>
<td>Brazing</td>
<td>4.21</td>
<td>.88</td>
<td>4.32</td>
</tr>
<tr>
<td>Welding Safety</td>
<td>4.69</td>
<td>.61</td>
<td>4.77</td>
</tr>
<tr>
<td>Oxy-fuel</td>
<td>4.62</td>
<td>.63</td>
<td>4.69</td>
</tr>
<tr>
<td>Manual Cutting</td>
<td>4.27</td>
<td>.88</td>
<td>4.34</td>
</tr>
<tr>
<td>Overall Composite Score</td>
<td>4.39</td>
<td>.76</td>
<td>4.50</td>
</tr>
</tbody>
</table>

Note. $^a$Prior to Instruction = August; $^b$End of Instruction = December; Scale: 1 = No Importance, 2 = Below Average Importance, 3 = Average Importance, 4 = Above Average Importance, 5 = High Importance; $^c$Practical effect per Cohen’s $d$; * = small effect; ** = medium effect; *** = large effect
Specifically, it was found that the construct in which pre-service teachers experienced the greatest amount of growth from the beginning of the semester to the end was manual arc welding \((\text{Mean Difference} = +.18)\). Welding safety was the construct with the highest mean importance score at the beginning \((M = 4.69; SD = .61)\) and end \((M = 4.77; SD = .46)\) of the semester. Brazing \((M = 4.21; SD = .88)\) and manual arc welding \((M = 4.21; SD = .89)\) were the constructs with the lowest mean importance score prior to instruction. Brazing \((M = 4.32; SD = .76)\) was the lowest mean importance score at the end of instruction for pre-service teachers (see Table 1).

Objective two was to compare pre-service agricultural education teachers’ perceived levels of confidence to teach selected welding skill constructs prior to and at the end of instruction. The construct regarding teachers’ confidence to teach with the greatest amount of growth prior to and at the end of instruction was brazing \((\text{Mean Difference} = +1.86)\). Welding safety was the construct with the highest mean confidence score prior to \((M = 3.86; SD = 1.11)\) and at the end of instruction \((M = 4.53; SD = .68)\). Brazing \((M = 2.26; SD = 1.17)\) was the construct with the lowest score for confidence prior to the semester. Welding knowledge \((M = 3.90; SD = .91)\) was the construct with the lowest score for confidence at the end of the semester for pre-service teachers.

Table 2

<table>
<thead>
<tr>
<th>Construct</th>
<th>Prior to Instruction(^a)</th>
<th>End of Instruction(^b)</th>
<th>Mean Differences(^c)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(M)</td>
<td>(SD)</td>
<td>(M)</td>
</tr>
<tr>
<td>Brazing</td>
<td>2.26</td>
<td>1.17</td>
<td>4.12</td>
</tr>
<tr>
<td>Manual Arc Welding</td>
<td>2.55</td>
<td>1.29</td>
<td>4.03</td>
</tr>
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<td>Oxy-fuel</td>
<td>2.84</td>
<td>1.39</td>
<td>4.28</td>
</tr>
<tr>
<td>Manual Cutting</td>
<td>2.60</td>
<td>1.35</td>
<td>3.96</td>
</tr>
<tr>
<td>Welding Knowledge</td>
<td>2.63</td>
<td>1.26</td>
<td>3.90</td>
</tr>
<tr>
<td>Welding Processes and Procedures</td>
<td>2.98</td>
<td>1.31</td>
<td>4.05</td>
</tr>
<tr>
<td>Welding Safety</td>
<td>3.86</td>
<td>1.11</td>
<td>4.53</td>
</tr>
<tr>
<td>Overall Composite Score</td>
<td>2.82</td>
<td>1.26</td>
<td>4.12</td>
</tr>
</tbody>
</table>

Note. \(^a\)Prior to Instruction = August; \(^b\)End of Instruction = December; Scale: 1 = No Importance, 2 = Below Average Importance, 3 = Average Importance, 4 = Above Average Importance, 5 = High Importance; \(^c\)Practical effect per Cohen’s \(d\); * = small effect; ** = medium effect; *** = large effect

A large, practical effect was noticed for six of the seven constructs measured regarding confidence (brazing, manual arc welding, oxy-fuel cutting, manual cutting, welding knowledge, and welding processes procedures). Welding safety had a medium, practical effect on students’ confidence as a result of the course (see Table 2). Overall, a large effect \((+1.30)\) was detected regarding students’ perceptions of their confidence to teach these welding constructs as a result of the 16-week course.

Objective three was to determine the relationship between pre-service agricultural education teachers’ perceived levels of confidence to teach selected welding skill constructs and final course grade. All pre-service teachers’ end-of-instruction responses regarding confidence were averaged to create an individual mean confidence measurement for each teacher in the study. Individual confidence means were then averaged to create a confidence grand mean score for pre-service teachers in the study. Also pre-service teachers’ end-of-instruction course scores were recorded, transposed, and averaged to create a final course grade mean score (see Table 3).
Table 3  
*The Relationship between Teachers’ Confidence to Teach Welding at the End of the Semester and their Final Course Grade*

<table>
<thead>
<tr>
<th>Pre-service Teachers’ Confidence Grand Mean Score</th>
<th>Final Course Grade Mean Score</th>
<th>r</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.11</td>
<td>78.07</td>
<td>.29</td>
<td>.03*</td>
</tr>
</tbody>
</table>

*Note. p = < .05; df = 56, Scale: 1 = No Confidence, 2 = Below Average Confidence, 3 = Average Confidence, 4 = Above Average Confidence, 5 = High Confidence*

When correlating teacher confidence and final course grade, the $r$-value was .29, indicating a positive, low relationship (Davis, 1971). The $p$-value was .03, indicating that there was a statistically significant relationship between the confidence measurement and final course grade of pre-service teachers (see Table 3). Therefore, the null hypothesis was rejected.

Objective four sought to determine the relationship between pre-service agricultural education teachers’ final course grade and level of previous work experience in welding. It was found that there was no statistically significant relationship ($p = 0$) between previous work experience in welding and pre-service teachers’ final course grade (see Table 4). Thus, the null hypothesis was accepted.

Table 4  
*Relationship among Pre-service Teachers’ Final Course Grade and Previous Work Experience*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Previous Work Experience in Welding</th>
<th>Final Course Grade</th>
<th>0.19</th>
</tr>
</thead>
</table>

Objective five was to compare pre-service agricultural education teachers’ levels of technical knowledge in welding prior to and at the end of instruction. On the 100-point, criterion-referenced examination, students averaged a score of 58.41 ($SD = 13.42$) prior to instruction (see Table 5). On the same examination, students averaged a score of 70.21 ($SD = 13.43$) at the end of instruction.

Students’ mean knowledge scores increased nearly 12 percent (11.8%) throughout the semester. Standard deviations remained nearly constant ($SD = 13.42$ prior to instruction; $SD = 13.43$ end of instruction). However, students’ minimum and maximum scores increased by 12 percent on measures taken prior to and at the end of instruction, respectively. Pre-service teachers demonstrated a statistically significant increase in welding technical knowledge ($p = .00$) at the end of instruction when compared to their scores prior to instruction. This change resulted in a large effect size (Cohen, 1988). Therefore, the null hypothesis was rejected in favor of the alternative hypothesis, indicating that there was a statistically significant difference in mean scores prior to and at the end of instruction ($p = < .05$).

Table 5  
*Pre-service Teachers’ Level of Technical Knowledge in Welding Prior to and at the End of Instruction*

<table>
<thead>
<tr>
<th>Variable</th>
<th>$M$</th>
<th>$SD$</th>
<th>$Min.$</th>
<th>$Max.$</th>
<th>$p$-value</th>
<th>Cohen’s $d$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prior to Instruction$^a$</td>
<td>58.41</td>
<td>13.42</td>
<td>28</td>
<td>84</td>
<td>.00*</td>
<td>.89</td>
</tr>
<tr>
<td>End of Instruction$^b$</td>
<td>70.21</td>
<td>13.43</td>
<td>40</td>
<td>96</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note. Range = $^a$0 to 100%; $^b$0 to 100%; $p = < .05$*
Conclusions

Pre-service teachers perceived positive levels in the importance of and their confidence to teach all seven welding constructs as a result of the 16-week course. Ratings showed small, practical differences regarding the importance of the welding constructs as a result of the semester-long course, with mean differences ranging from +.07 to +.18. However, confidence scores showed large practical effects, with ratings ranging from +.67 to +1.86. As a result, the course had a small, practical effect on students’ perceptions of the importance of the welding constructs and a large practical effect on their confidence to teach the constructs.

Regarding confidence, pre-service teachers began the semester ranging between below and average confidence on the seven welding constructs. However, by the end of the semester, teachers were above average in their confidence levels to teach the constructs. What is more, the course had a large practical effect on students’ confidence to teach them. In a teacher preparation program, this finding is encouraging because confidence can lead to mastery (Bandura, 1997)—in this case, teaching agricultural mechanics effectively.

Pre-service teachers placed a high amount of importance on welding safety both prior to and at the end of instruction. Safety precautions should always be considered, regardless of the sector of the agricultural industry in which an individual works (Slusher, Robinson, & Edwards, 2011). As such, it was encouraging to see that these individuals recognized the importance of safety, especially in a laboratory setting where danger is present constantly. The need to be attentive to safety specific to agricultural mechanics laboratories has been documented well in the literature (McKim & Saucier, 2011; Saucier, McKim, & Tummons, 2012; Saucier, McKim, Murphy, & Terry, Jr., 2010; Saucier, Terry, Jr., & Schumacher, 2009).

Pre-service teachers rated the importance of all constructs higher than their confidence to teach them. Further, when comparing overall composite means, the importance composite score was higher than the confidence composite score. This finding supports previous research by Radhakrishna and Bruening (1994) and Robinson et al. (2007) who concluded that graduates tended to rate items higher on importance than their self-perceived competence to perform them.

No statistically significant relationship existed between pre-service teachers’ prior work experiences in welding and their grade in the course. This finding contradicts Bandura’s (1997) assertion that experiences lead to mastery and competency.

The course resulted in pre-service teachers obtaining above average confidence in teaching the seven welding constructs. Further, the course had a statistically significant effect on students’ knowledge of welding. This resulted in a large effect size, and enabled pre-service teachers to advance their knowledge in welding from a failing grade at the beginning of the semester, to a grade of C at the end of the semester—a 12% increase. This finding supports Bandura’s (1997) notions that confidence improves with performance. In addition, it implies that these pre-service teachers were beginning to master their knowledge in welding toward the end of the semester, which is another important source of developing self-efficacy (Bandura, 1997).

Recommendations for Future Research

This study focused on pre-service teachers’ abilities to teach constructs devoted to welding, with a particular focus in hot metal work. However, agricultural mechanics is much more diverse than being solely about welding. Therefore, future studies should be conducted on additional areas of agricultural mechanics curriculum, such as concrete, plumbing, electricity, and small gas engines, to determine pre-service teachers’ regard for their importance in the secondary classroom as well as their level of confidence to teach them effectively.

Further research also should assess the impact this course will have on these pre-service teachers long term. For instance, are students who took the course prepared better in agricultural mechanics versus than those who did not? Does this preparation lead to more effective teaching in the agricultural mechanics laboratory and, in turn, affect these future teachers’ students positively? Specifically, are secondary...
students whose teachers participated in this course more proficient at performing agricultural mechanics competencies on end-of-instruction examinations than those who did not? Follow-up studies should be conducted.

This study revealed that these pre-service teachers’ confidence and knowledge in welding increased as a result of the course. However, it is not certain that these teachers have mastered the art of teaching welding. Therefore, a longitudinal study should be conducted to determine if and when these teachers develop the human capital necessary to fully master the welding skills needed to be an effective teacher in the classroom and laboratory settings (Bandura, 1997; Knobloch & Whittington, 2002). Because mastery experience is the most effective way of creating self-efficacy (Bandura, 1997), it would be important to determine if the pre-service teachers who had higher confidence and knowledge scores in this study are able to assist their students in achieving higher end-of-the-year, state-mandated examination scores, as opposed to the students of teachers who had lower confidence and knowledge scores.

Regarding safety, it was found to be the highest rated construct prior to instruction. Because of its high initial rating by pre-service teachers at the beginning of the semester, it was the construct that experienced the least amount of growth when comparing teachers’ confidence to teach the constructs at the end of the semester. However, indicating an appreciation for safety and actually practicing safety are two different perspectives. Therefore, follow-up studies should include attempts to determine if teachers are able to teach and practice safety effectively with secondary agriculture students once they enter the teaching profession.

**Recommendations for Practice**

Pre-service teachers rated welding knowledge and manual cutting as the lowest mean score constructs. Because developing human capital is largely contingent on knowledge acquisition (Schultz, 1961), additional emphasis on these areas should be offered to pre-service teachers. Specifically, at Oklahoma State University, opportunities exist for faculty to offer one-credit hour weekend courses throughout the fall and spring semesters. To that end, teacher educators at OSU should consider offering additional coursework to pre-service teachers regarding welding knowledge and manual cutting. Additionally, the findings of this study should be applied to in-service teachers as well. Because this study employed a time and place sample (Oliver & Hinkle, 1982), it can be assumed that former pre-service teachers who are now in-service teachers received the same training and preparation and likely have the same needs regarding agricultural mechanics. As such, professional development should exist in the way of welding knowledge and manual cutting.

Because agricultural education exists to prepare students for college and careers, simultaneously (Roberts & Ball, 2009), further discussions need to exist with in-service teachers regarding employment possibilities for high school graduates in the welding sector of the agricultural mechanics industry. Understanding the opportunities that exist could encourage teachers to develop expertise in the areas identified in this study. Helping teachers realize the numerous career opportunities available in welding and agricultural mechanics has implications for building a sufficient workforce in the 21st Century, which corresponds with priority number five of the National Research Agenda (Doerfert, 2011).

Because there was a statistically significant relationship between pre-service teachers’ confidence to teach welding skills and their final course grade, it is recommended that the course continue allowing student experiences that increase their human capital in welding. Perhaps these students could work in groups or teams to receive additional observation and modeling regarding effective welding practices. Bandura (1997) noted the impact vicarious learning can have on an individual’s level of self-efficacy. So, perhaps students’ levels of self-efficacy would elevate higher if they worked in teams to achieve these tasks. Specifically, because all seven welding constructs were rated above average on importance by pre-service teachers both prior to and at the end of instruction, the instructor of record for this course should continue to teach each one of them.
Finally, performing welding skills as a student and teaching them as an instructor are two separate issues. In other words, just because human capital was acquired as a result of this course does not mean that it will be sustained and practiced in the field when these pre-service teachers enter the profession. Because these pre-service teachers were not full-time teachers, caution is issued with making wholesale changes to the curriculum or generalizing the results of this study to the larger profession. To determine if these participants can teach these skills, microlessons should be developed and microteachings should be conducted and scored by university supervisors in pre-service teaching methods courses.

Implications

At the end of the semester, pre-service teachers had above average confidence in teaching the seven welding constructs measured in this study. Yet, their final grade in the class was barely passing (C) and a low, positive relationship existed. What does this finding mean? Could it be that these pre-service teachers overestimated their abilities to master these constructs? Knobloch and Whittington (2003) stated that student teachers tend to be overly confident in their abilities to teach in the classroom. Further, it is also possible that the reason students’ course grade and mean confidence score experienced a low, positive relationship was due to the fact that students might see their educational courses as a mere checklist of criteria that has to be completed to earn a degree instead of realizing the value these courses will have on their career readiness long term. Said another way, perhaps some students see education as a series of hurdles to clear prior to entering the workforce and not as an opportunity to invest in their human capital, which will lead to employability. Therefore, it is possible that the reason students have elevated confidence but lower test scores is due to not taking their coursework seriously. These students should be reminded that, according to principals, the most important factor of human capital when employing an entry-level agriculture teacher in Oklahoma is academic rigor (Robinson & Baker, 2012).

It is concerning that the lowest rated construct score for confidence at the end of the semester was welding knowledge. How can students be more confident in teaching all other constructs related to welding knowledge, yet score the actual welding knowledge construct lowest by comparison? What does this mean about the pedagogy offered in the course? Perhaps students understand the skills needed to perform certain skills, like brazing; however, they fail to recognize how to synthesize these skills into a format conducive to teaching and learning. An example of skills listed under the welding knowledge construct are: selecting and using shielded gas, identifying major parts of gas metal arc (MIG) welding, and identifying welding errors. Implications exist for teacher educators to help pre-service teachers understand the basics of agricultural mechanics curriculum from a teaching and learning standpoint. These students need assistance in critiquing their own work and making decisions for why they choose one piece of equipment over another.

This study revealed that prior work experience did not affect teachers’ confidence in welding. This finding is concerning considering the fact that experience is a core tenant of human capital (Becker, 1964; Schultz, 1971). It would seem that students with experience in welding would be more confident in their ability than those who had no experience. Perhaps the type of experience students received was not positive or was miseducational in nature. Unlearning bad habits can be time consuming and difficult. As such, current agricultural education teachers should monitor the instruction being offered in secondary agricultural mechanics courses to ensure that students receive positive experiences in welding.

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BRIAN L. LEIBY is a Secondary Agriculture Teacher at Marionville, MO, PO Box 409, Marionville, MO 65705, bleiby@marionville.k12.mo.us

J. SHANE ROBINSON is an Associate Professor of Agricultural Education in the Department of Agricultural Education, Communications and Leadership at Oklahoma State University, 457 Agricultural Hall, Stillwater, OK 74078-6032, shane.robinson@okstate.edu

JAMES P. KEY is a Professor of Agricultural Education in the Department of Agricultural Education, Communications and Leadership at Oklahoma State University, 451 Agricultural Hall, Stillwater, OK 74078-6032, james.key@okstate.edu
Variable Relationships Affecting Agriscience Teachers’ Stages of Concern for Content Area Reading Strategies

Anna J. Warner
Carroll County Schools
Brian E. Myers
University of Florida

In spite of national initiatives such as the No Child Left Behind Act of 2001, American students continue to be struggling readers. Research on content area reading strategies (CARS) has shown that such strategies increase students’ ability to read and comprehend text. The purpose of this research was to assess agricultural educators’ implementation of content area reading strategies in their classroom. A tailored-design, web-based questionnaire was distributed to 371 Florida agriscience educators to complete this descriptive, census survey. The results indicated the total number of hours of CARS professional development was not related to progression through the stages of concern. This study also underscored the lack of consistency in the professional development programs these teachers completed. In order to better understand the differences of the professional development programs, research should be conducted to determine the characteristics of various CARS professional development programs. Practitioners should provide a consistent, in depth professional development program to provide ongoing training and support throughout a several year process.

Keywords: Reading strategies; teacher professional development; academic integration; Stages of Concern; Content Area Reading

The U.S. Department of Education [USDE] has reported over eight million struggling readers in the United States between fourth and twelfth grade (2003). Additionally, for over 20 years, math achievement and SAT scores have been increasing while verbal scores have remained stable or declined slightly (College Board, 2002; USDE, 2008). When comparing international reading proficiency, U.S. students have ranked toward the bottom, even below students from developing countries (Snow, 2002). These statistics have prompted a number of state and national reading initiatives. In an attempt to provide higher quality education to America’s students, the No Child Left Behind (NCLB) Act has mandated a major change across the nation in education, with a large section of the NCLB Act focused on improving student literacy. However, a NCLB accountability report, published by the USDE, highlighted continuing literacy problems in spite of the earlier call for improvement. Only about 30% of fourth and eighth grade students performed at the proficient reading level, with students of low socioeconomic status and different ethnicities performing much lower. Two percent of the same students performed below basic levels (Mapping America’s Educational Progress, 2008). Since 2002, students have made steady improvements in math scores. However, fourth graders have improved their reading scores minimally and eighth graders’ reading scores have slightly declined. The Mapping Florida’s Progress 2008 report shows that Florida’s students rank below the national average for reading achievement.

Park (2008), in notes from a roundtable discussion at the National Agricultural Education Inservice regarding literacy in agricultural education, emphasized the unique ability agric-
science teachers possess to facilitate content area reading in students who are motivated to learn the content. If agriscience teachers purposefully introduce reading strategies into instruction, these teachers have the ability to increase student reading motivation and comprehension. These experiences provide students with opportunities to learn lifelong literacy skills and engage students in the content (Park, 2008; Fisher & Ivey, 2005). However, historically, agriscience teachers have been the most resistant group of educators to the adoption and implementation of Content Area Reading Strategies [CARS]. O’Brien and Stewart (1990) found that of the pre-service content area teachers included in their study, agricultural educators nationally were the most opposed to classroom reading implementation. Eighty-five percent of the pre-service agricultural educators rejected content area reading (O’Brien & Stewart). More recently, Park and Osborne (2006a) identified teachers’ lack of knowledge and confidence in CARS implementation as the main obstacles to incorporating reading into agricultural education programs with agriscience teachers unable identify specific CARS to implement in their curricula (Park and Osborne, 2006b).

Successful implementation and continuation of CARS instruction relies on prolonged professional development and support for teachers (Vacca, 2002a; Vacca 2002b). A school-wide effort for CARS professional development relying on proper organization, leadership, scheduling, and development is needed (Meltzer, 2001). Meltzer noted the need for continuing cycles of “(1) examining the outcomes, (2) reviewing and improving program components, (3) seeking practical feedback, and (4) implementing improvements” to ensure successful professional development support for CARS (p.7).

Educators, politicians, and parents have investigated how to improve student performance in all areas of education, especially literacy. School systems have invested time and money in teacher CARS professional development. Park and Osborne (2006b) stated the need to research the effectiveness of CARS professional development programs and the utilization of CARS in agriscience. An objective evaluation of the success of teacher professional development programs in content area reading in agriscience is needed to validate the continuation of these programs. In order to evaluate the success of an innovation, documentation of implementation must be achieved (Hall & Hord, 2006). Have teachers who have completed CARS professional development programs implemented CARS into the classrooms? The problem under investigation in this study was, what factors have influenced agriscience teachers’ implementation of CARS instruction?

Literature Review/Theoretical Framework

The Concerns-Based Adoption Model [CBAM] (Hall & Hord, 2006) (Figure 1) was chosen as the theoretical base of this study for three reasons: 1) it is based on 35 years of research focused on educational change, 2) it has been extended and tested in different settings, and 3) it is recognized as one of the strongest models for educational change (Hall & Hord; Anderson, 1997). This research-based model is designed to facilitate change and provide a diagnostic method to measuring implementation of an innovation (Hall & Hord). The model consists of the environment, the user system culture, resource system, change facilitator team, interventions, users and nonusers, and three diagnostic measures: stages of concern, levels of use, and innovation configurations (Hall & Hord).

Stages of Concern [SoC] is a diagnostic component which addresses the affective side of change (Hall & Hord, 2006). The feelings and perceptions of participants are known as concerns. The SoC was developed based upon research on the evolution of concerns throughout the change process and depict a progression of concerns through which people move during the implementation process. Knowing teachers’ concerns can help judge implementation of change or can be used to develop focused workshops, provide individual coaching, and create strategic plans to more effectively facilitate change.

Based on Fuller’s (1969) identification of concerns, Hall and Hord (2006) have developed seven Stages of Concern. George, Hall, and Stiegelbauer (2006) offered the following definitions for each of the Stages of Concern:
0 **Awareness**: Little concern about or involvement with the innovation is indicated.

1 **Informational**: A general awareness of the innovation and interest in learning more detail about it is indicated.

2 **Personal**: [The] individual is uncertain about the demands of the innovation, his/her inadequacy to meet those demands, and his/her role with the innovation.

3 **Management**: Attention is focused on the processes and tasks of using the innovation and the best use of information and resources.

4 **Consequences**: Attention focuses on impact of the innovation on clients in his or her immediate sphere of influence.

5 **Collaboration**: The focus is on coordination and cooperation with others regarding use of the innovation.

6 **Refocusing**: The focus is on the exploration of more universal benefits from the innovation, including the possibility of major changes or replacement with a more powerful alternative.

Research has shown “there is a quasi-developmental path to the concerns as the change process unfolds” (Hall & Hord, 2006, p. 141). Although, they stated that neither the progression of concerns nor the direction of the progression is guaranteed. When proper conditions exist (i.e. appropriateness of change, proper involvement from leaders, and effective facilitation) participants move from Stages 1 & 2 to Stage 3 during the first couple years, and ideally they will move to Stages 4 & 5 around three to five years into implementation. Undesirable conditions can cause participants to cease progression or regress. Hall and Hord (2006) highlighted, SoC “reflect the idealized, developmental approach to change” (p. 142). Anderson (1997) explains, “CBAM theory idealizes the Stages of Concern as a developmental progression in which teachers implementing a change have concerns of varying intensity across all seven stages at different points in the change process” (p. 334). However, teacher concern may not progress through all stages in the suggested order.

Based upon a thorough literature review, the researchers identified the conceptual framework variables and created a conceptual model pictured in Figure 1. The conceptual model depicts the internal and external variables related to agriscience teachers’ concerns regarding the implementation of content area reading strategies.
The researchers identified teacher attitudes, confidence, knowledge and experience, motivation, perceptions and conceptions, and teaching philosophy as internal variables for CARS implementation. Park and Osborne (2006a) studied agriscience teachers’ attitudes concerning CARS and identified motivation, pressures, and barriers related to CARS implementation. Teachers were motivated to use CARS so students could establish background information. Pressures included the diversity of students and their reading abilities and the documentation of reading for administrators. Park and Osborne’s findings identified that although teachers had a fundamental knowledge of CARS, several barriers concerning teachers’ knowledge and confidence existed. However, the researchers found that positive teacher attitudes could also be passed to the students.

Teacher confidence and comfort with the innovation played a substantial role in implementation of information and communication technologies (Granger, Morbey, Lotherington, Owston, & Wideman, 2002). Park and Osborne (2004) acknowledged a lack of confidence in agriscience teachers’ ability to use CARS and highlighted their lack of practice with CARS as a cause. Park and Osborne (2006a) identified a lack of confidence in utilization and lack of knowledge on the proper use of CARS as major implementation barriers.

In exploring agricultural educators’ motivation to utilize CARS, Park and Osborne (2006a) found that no teachers “consciously implemented reading or CARS” (p. 43). They utilized reading assignments and corresponding questions as a way to establish baseline information or for substitute plans. Some of the participants did understand the importance of CARS. However, when participants knew they were in a study, teachers in a comparison group of a CARS study implemented twice the strategies as teachers in the treatment group (Park & Osborne, 2004). Park and Osborne (2004) concluded “with proper motivation, agriscience teachers may be willing to alter their preferred teaching methods and adopt new CARS.”

Content teachers, including agriscience teachers, realized the importance of teaching specific comprehension skills for the content area (Bryant, Ugel, Thompson, Hamff, & Hougen, 2001; Park & Osborne, 2006b). Agriscience teachers believed reading was important for learning in agriscience, yet many teachers fail to assign individual texts to students which may “hinder reading development” (Park & Osborne, 2006b, p. 11). Park and Osborne recommend using trade journals and electronic texts in the agriscience classroom. They also suggested teachers focus more efforts on activities during the pre- and during-reading periods, model reading, and incorporate CARS into classroom instruction.

From the literature, the researchers identified discipline, mandates, professional development, and social context as external variables for CARS implementation. Aneke and Finch (1997) found no significant difference when comparing SoC based on vocational and academic teaching areas; however, they did not make comparisons within specific disciplines. Conversely, Bean (1997) found that preservice teachers’ judgment of what CARS worked well for the discipline was a factor when selecting CARS. Moje (1996) found that students did not transfer CARS to other classrooms. She supported teaching domain-specific content literacy methods in each discipline, so students develop social practices and knowledge necessary to apply them to that specific domain.

Park and Osborne (2004) found that agriscience teachers wanted additional professional development in CARS which addressed “where, how and why to use CARS in their agriscience courses” (p. 138-139). The teachers understood they needed further professional development and time to effectively incorporate CARS. Park suggested providing an opportunity for teachers to practice using and teaching the strategies during professional development.
Purpose and Objectives

The purpose of this research was to assess agricultural educators’ implementation of content area reading strategies (CARS) in their classrooms. In order to meet the purpose of this study, the following objectives were investigated:

1. Determine the relationship between CARS professional development and the Stages of Concern of agriscience teachers.
2. Determine the relationship between CARS conceptual variables (age, involvement with other innovations, frequency of incorporation, gender, length of involvement, teaching experience, perceived level of expertise, & relationship with reading coach) and agriscience teachers’ primary Stage of Concern.

Methodology

A descriptive census survey design was used in this study. The researcher used a web-based questionnaire to collect the Stages of Concern and contributing variables of Florida agriscience teachers towards the implementation of content area reading strategies (CARS). The population for this study was Florida agriscience teachers. The researcher obtained a list of current Florida agriscience teachers (N = 371) from the 2008 Florida Agricultural Education Directory which served as the population frame (Myers & Warner, 2008). The 2008 Florida Agricultural Education Directory was chosen as the population frame because it functioned as the only updated, comprehensive list of Florida agriscience teachers in the state at the time of this study (fall 2008) and thus was the best possible control of frame error. Two hundred fourteen questionnaires were completed for an overall response rate of 57.7% (n = 214).

The researcher utilized the Stages of Concern Questionnaire (SoCQ) developed by George et al. (2006). The Stages of Concern Questionnaire (SoCQ) is the most rigorous and reliable form of SoC assessment (Hall & Hord, 2006). This questionnaire is composed of 35 Likert-type questions that assess the concerns of the individuals involved in the educational innovation change process – in this case the integration of Content Area Reading Strategies (CARS). This questionnaire allows respondents to indicate the relevance and intensity of their concerns towards CARS. In addition to the Likert questions, a free-response question was included to allow participants to express their concerns in their own words, as recommended by Hall and Hord (2006) and G. Hall, personal communication (2008).

In addition to the SoCQ, the researcher included several questions to determine the CARS professional development history of the teachers. Teachers were asked to indicate whether they had completed different levels of training, give the numbers of hours spent in each type of training, and provide a brief description of the training. Lastly, demographic questions were included to better understand the population and to assess the conceptual variables identified.

Upon IRB approval, the researcher proceeded with the survey guided by the Tailored Design Method (Dillman, 2007) for survey collection. Descriptive statistics, including frequencies and central tendencies, and correlational statistics were used to analyze the concerns of agriscience teachers towards CARS. Additionally, the SOCQ-075 Graph and Print program was used to create an overall concerns profile for the group (Scott & Persichitte, 2006).

Dillman (2007) recommended addressing nonresponse error in all survey-based research studies because the potential for this type of error exists in all survey research. Since it would be challenging to address the Stage of Concern variable in a brief phone survey with nonrespondents, concern profiles were created for early respondents and late respondents. Ary, Jacobs, Razavieh, and Sorensen, (2006) stated that research has shown that similarities usually exist between late respondents and nonrespondents. Pace (1939) found that nonrespondents and late respondents are similar. These similarities allow for researchers to estimate the responses of nonrespondents based upon late respondents. Thus, early and late respondents were compared to address nonresponse error. Early respondents (n = 66) were defined as the participants who responded to the cover letter with the first link to the survey, before the reminder e-mail was sent.
Late respondents \((n = 42)\) were defined as participants who responded after the final contact was made. Concern profiles for both groups were non-user profiles showing resistance to change. Due to the similarity of the profiles, no significant difference between respondents and nonrespondents, in this population, is expected.

**Findings**

Of the respondents, 55.6\% \((n = 85)\) were male and 44.4\% \((n = 68)\) were female. The age range with the greatest number of participants was 51-60 with 29.4 \% (Table 1). The age range with the least amount of participants was >60 with 5.9\%.

<table>
<thead>
<tr>
<th>Age Range</th>
<th>(f)</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>51-60</td>
<td>45</td>
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<tr>
<td>21-30</td>
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<td>33</td>
<td>21.6</td>
</tr>
<tr>
<td>31-40</td>
<td>28</td>
<td>18.3</td>
</tr>
<tr>
<td>&gt;60</td>
<td>9</td>
<td>5.9</td>
</tr>
</tbody>
</table>

*Note. \(f=\) frequency.*

Teachers reported their number of years teaching to be between 0 and 40 with a mean of 15.2 years. When teachers were asked if they have taught any subjects in addition to agriculture, 53.2\% \((n = 82)\) responded yes, while 46.8\% \((n = 72)\) responded no. Participants were asked how long they have been involved with content area reading strategies, not counting this year. Of the responses, 48.4\% \((n = 74)\) responded they had never been involved with the innovation and 15.7\% \((n = 24)\) responded they have been involved for five or more years.

When asked at which level of expertise the participant considered himself/herself to be, over 60\% of the participants considered themselves to be non-users or novice users. Almost 40\% considered themselves intermediate users or old hands. None of the respondents considered themselves to be a past user of the innovation (Table 2).

<table>
<thead>
<tr>
<th>Perception</th>
<th>(f)</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-user</td>
<td>51</td>
<td>33.3</td>
</tr>
<tr>
<td>Novice</td>
<td>45</td>
<td>29.4</td>
</tr>
<tr>
<td>Intermediate</td>
<td>43</td>
<td>28.1</td>
</tr>
<tr>
<td>Old hand</td>
<td>14</td>
<td>9.2</td>
</tr>
<tr>
<td>Past user</td>
<td>0</td>
<td>0.0</td>
</tr>
</tbody>
</table>

*Note. \(f=\) frequency.*

Participants were asked how often they have been incorporating CARS into their lesson. Respondents indicated 16.3\% \((n = 24)\) incorporated CARS 3-4 times a week. A third of the respondents \((n = 49)\) reported incorporating CARS< 1 per month. Concern profiles were developed based on teachers’ frequency of use of CARS (Figure 2). Each of these profiles were nonuser profiles with a slight negative one-two split. According to concern profile interpretation guidelines provided by George et al. (2006), the negative one-two split occurs when personal concerns are higher than informational concerns. This indicated that teachers were more concerned about how the use of CARS would affect their position and job security than they were about learning more about the concern. Teachers with a negative one-two split may demonstrate resistance to the change. Their personal concerns need to be addressed for them to continue to progress through implementation. Weekly and monthly users had slightly higher intensity concerns than seldom and nonusers.
Figure 2. Concerns profile for teachers based on frequency of use.

The major difference in these three profiles, was the direction of the tail of the graph at Stage 6. The weekly users score for Stage 6 was the same as their score for Stage 5, thus the profile neither tailed up or down. Monthly users had only a slight tailing-up of three points, which indicated that they have other ideas which may be competing with the innovation, but these ideas have not caused much resistance to the innovation (George et al. 2006). Seldom and nonusers have a tailing-up of 9 points. This indicated a resistance to the implementation of CARS.

Participants were asked to rate their working relationship with the reading coach from their school. One-third of respondents indicated they had a weak or very weak relationship with the reading coach. Only about 26% ($n = 39$) of respondents considered their relationship to be strong or very strong, but two-thirds rated their relationship average or higher.

Participants were asked if they have been currently involved in the first or second year of another major innovation or program. In response to this question, 55.6% ($n = 85$) of the respondents indicated they were involved in the first or second year of another major innovation and 44.4% ($n = 68$) of the respondents indicated they were not involved in the first or second year of another major innovation. These innovations focused on incorporating reading, science, math, technology, active learning strategies, and differentiated instruction in the classroom.

The teachers were asked what they believed to be the biggest barriers to CARS implementation in their school (Table 3). Of the respondents, 5.4% ($n = 6$) were unsure what barriers existed. The number one barrier identified by the respondents was time (33.9%; $n = 38$).

Table 3

<table>
<thead>
<tr>
<th>Barrier</th>
<th>f</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time</td>
<td>38</td>
<td>41.3</td>
</tr>
<tr>
<td>None</td>
<td>15</td>
<td>16.3</td>
</tr>
<tr>
<td>Other demands</td>
<td>10</td>
<td>10.9</td>
</tr>
<tr>
<td>Training needs</td>
<td>8</td>
<td>8.7</td>
</tr>
<tr>
<td>Unsure</td>
<td>6</td>
<td>6.5</td>
</tr>
<tr>
<td>Planning and preparation</td>
<td>5</td>
<td>5.4</td>
</tr>
<tr>
<td>Materials/resources</td>
<td>4</td>
<td>4.3</td>
</tr>
<tr>
<td>Student interest and motivation</td>
<td>4</td>
<td>4.3</td>
</tr>
</tbody>
</table>

Note. $f=$frequency, $\% = >100$ due to teachers identifying multiple barriers.
Stages of Concern profiles were developed based on the number of professional development hours completed (Figures 3-5). Overall, a general pattern did not emerge from the profiles based on the amount of professional development they received. Each profile was characterized by a high relative intensity (88-99) in Stage 0, Awareness, with the exception of teachers with 81-90 hours of professional development. Of the 14 profiles developed, between 1 and >130 hours of professional development, 9 of them tail-up. The tailing-up indicates that teachers have other ideas which compete with the innovation (George et al. 2006). From the 9 profiles which tail-up, 6 of them increase more than 10 percentile points. Some of the profiles identified strong peaks, such as those with 61-70 hours of research in management and those with > 130 hours in collaboration. According to standards set by George et al., all profiles for all levels of professional development were classified non-user profiles.

Figure 3. Group concerns profiles for teachers with 0-40 hours of CARS professional development.

Figure 4. Group concerns profile for teachers with 41-90 hours of CARS professional development.
George et al. (2006) suggested analyzing the primary Stage of Concern of participants. Frequencies were calculated on the primary Stage of Concern for participants (Table 4). The majority of participants’ (51.3%, n = 96) primary Stage of Concern was in the awareness stage, Stage 0.

Table 4
Primary Stage of Concern frequencies (n = 187)

<table>
<thead>
<tr>
<th>Primary Stage of Concern</th>
<th>f</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stage 0 – Awareness</td>
<td>96</td>
<td>51.3</td>
</tr>
<tr>
<td>Stage 2 – Personal</td>
<td>29</td>
<td>15.5</td>
</tr>
<tr>
<td>Stage 3 – Management</td>
<td>28</td>
<td>15.0</td>
</tr>
<tr>
<td>Stage 1 – Informational</td>
<td>23</td>
<td>12.3</td>
</tr>
<tr>
<td>Stage 5 – Collaboration</td>
<td>7</td>
<td>3.7</td>
</tr>
<tr>
<td>Stage 6 – Refocusing</td>
<td>4</td>
<td>1.9</td>
</tr>
<tr>
<td>Stage 4 – Consequences</td>
<td>0</td>
<td>0.0</td>
</tr>
</tbody>
</table>

Note. f = frequency.

Correlations were calculated to determine the magnitude and direction of the relationship between conceptual variables and the primary Stage of Concern. Correlations between variables with ordinal data were calculated using Spearman’s rho (Table 5). All of the correlations were determined to be positive with the exception of frequency of incorporating CARS, past teaching experiences, and current involvement in other innovations which were determined to be negative correlations.

Teachers perceived level of expertise had a moderate correlation coefficient above 0.30. Frequency of incorporating CARS and relationship with the reading coach had low correlation coefficients between 0.10 and 0.29. Current involvement in other innovations, number of years teaching, and gender had negligible correlation coefficients between 0.01 and 0.09.
Table 5
Spearman’s rho correlation coefficient between demographic variables and primary Stage of Concern

<table>
<thead>
<tr>
<th>Demographic</th>
<th>n</th>
<th>r</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceived level of expertise</td>
<td>153</td>
<td>.30</td>
</tr>
<tr>
<td>Frequency of incorporating CARS</td>
<td>147</td>
<td>-.29</td>
</tr>
<tr>
<td>Length of involvement with CARS</td>
<td>153</td>
<td>.26</td>
</tr>
<tr>
<td>Relationship with reading coach</td>
<td>144</td>
<td>.20</td>
</tr>
<tr>
<td>Age</td>
<td>153</td>
<td>.18</td>
</tr>
<tr>
<td>Past teaching experiences</td>
<td>154</td>
<td>-.14</td>
</tr>
<tr>
<td>Current involvement in other innovations(^1)</td>
<td>148</td>
<td>-.09</td>
</tr>
<tr>
<td>Number of years teaching</td>
<td>152</td>
<td>.09</td>
</tr>
<tr>
<td>Gender(^2)</td>
<td>153</td>
<td>.07</td>
</tr>
</tbody>
</table>

\(^1\) Coded: 1 = involved in other innovations; 2 = not involved in other innovations
\(^2\) Coded: 1 = male; 2 = female

Conclusions & Recommendations

Gender of the participants, other teaching experiences, nor certification area had a strong relationship to their primary Stage of Concern. This study concurred with Aneke and Finch’s (1997) conclusion that years of teaching experience did not affect teachers’ SoC. This conclusion indicates teachers with different areas of certification and various levels of teaching experience can successfully implement CARS. Researchers should further investigate if specific types of experiences find it easier to integrate CARS.

Length of involvement with the innovation and participants’ primary Stage of Concern had a low magnitude correlation (r = .26) indicating, as teachers have more experience with the innovation, their concerns had a slight tendency to progress to higher stages. These findings reinforce the 3-5 year time frame Hall and Hord (2006) identified for an innovation to be implemented at a high level and the first change principle “Change is a process, not an event” (p. 4). However, the correlation only explains 6.86% of the variance. Additionally the finding corroborated Aneke and Finch’s (1997) conclusion that teachers with more innovation-related experience had further progressed concerns. However, the correlation between the frequency of CARS incorporation and teachers’ primary Stage of Concern contradicted Aneke and Finch’s finding. This negative correlation indicated that teachers who incorporated CARS more frequently tended to have lower primary Stages of Concern.

When profiles were developed based upon weekly, monthly, and seldom/never use of CARS, no substantial differences were found, which did not support any of the literature or other findings. Although social desirability bias, when respondents answer the way they think they are supposed to answer, rather than responding with the truthful answer, may offer one explanation to this oddity (Ary et al., 2006). If teachers misreported the frequency with which they utilize CARS based on how often they are suppose to use CARS rather than reporting their actual usage, they could have biased the information collected and caused the peculiarity in the findings. More research should be completed to determine if this correlation can be supported or not.

The third of participants (n = 48) who reported a weak or very weak relationship with their reading coach may have an opportunity to progress through the Stages of Concerns by developing a stronger relationship. The reading coach should participate on the change facilitator team for the CARS innovation to provide their expertise and develop relationships with the teachers. Teachers with a better working relationship with the reading coach will most likely feel more comfortable to approach the reading coach for support or more confident in the information the reading coach provides them. Hall and Hord (2006) underscore the importance this interaction plays in successful im-
plementation. Close working relationships between agriscience teachers and reading coaches should be nourished and researchers should investigate the effects of these relationships to CARS implementation.

Teachers tend to move through the Stages of Concern as their perceived level of expertise increases. This self-perceived expertise accounted for 9.12% of the variance. This supports Aneke and Finch’s (1997) conclusion that teachers’ concerns progressed as their experience with the innovation increased. Teachers can improve the effectiveness and efficiency of their use of CARS from their experiences. As these teachers become more effective in their use of the strategy and it becomes a natural teaching tool, they can focus more on the high level concerns and less on the lower level concerns. Building experiences through professional development programs may enable teachers to progress through the Stages of Concern faster.

The large standard deviation (SD = 52.20) and range (312) between the total number of professional development hours indicated a lack of consistency in professional development programs completed by agriscience teachers. The results have clearly indicated that the total number of CARS professional development hours is not related to progression through the Stages of Concern. These results contradict Aneke and Finch (1997) who found that Stages of Concern profiles and the intensity of the concerns changed when grouped by “hours of reform-related training” (p. 10). However, Aneke and Finch underscored the importance of these trainings to address the personal concerns of the participating teachers. This observation may indicate that it is more important to focus on the quality of the professional development and its ability to meet the needs of the teachers, rather than just the number of hours spent in professional development.

Baker, Gersten, Dimino, and Griffiths (2004) identified three key components of a professional development program which led to sustained success of an educational innovation. These components included: (1) an initial training to establish the big picture, (2) on-going, on-site support for the first 5 years, and (3) school investment of funds. The authors emphasized the importance of providing on-going support throughout the implementation process which supports similar suggestions made by Hall and Hord (2006). Agriscience teachers have acknowledged that implementing this innovation will require time to adapt (Park, 2005). Ongoing support during this adaptation period should make the process more effective and more efficient.

Based on this study, the researcher suggests that practitioners consider the following recommendations:

1. A consistent, in depth professional development program should be implemented to provide ongoing training and support of the innovation throughout a several year process.
2. Professional development should provide an opportunity for teachers to demonstrate and practice their CARS skills.
3. Schools should utilize Stages of Concern questionnaires measure the effect of professional development on Stages of Concern and measure the success of implementation.

This study has identified the need for research in the following areas:

1. Research should be conducted to verify the concern profiles developed for the participants in this study.
2. In order to better understand the differences of the professional development programs, research should be conducted to determine the characteristics of various CARS professional development programs.
3. Research should be completed on the effectiveness of different professional development programs in order to be able design more effective and efficient programs.
4. To better meet the professional development needs of teachers, research should be conducted to identify the specific CARS professional development needs of agriscience teachers.
5. Further research should examine these variables and their relationship to the CARS innovation.
6. Motivation levels of agriculture teachers to participate in the CARS innovation implementation. Professional development theory holds that successful implementation and continuation of CARS instruction is relies heavily on sustained consistent teacher professional development and support (Vacca, 2002a, Vacca 2002b). The findings of this study suggest that professional development opportunities provided to agriscience teachers in the area of Content Area Reading Strategies is neither sustained nor consistent. This incongruence must be addressed by the profession in order or any real impact to be realized in the agriscience classrooms. Without consistency in the method and message of teacher professional development, research in assessing the impact of such activities will continue to be very difficult.

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ANNA J. WARNER is an Agriscience Teacher at Manchester Valley High School, 3300 Maple Grove Rd., Manchester, MD 21102, ajwarne@carrollk12.org

BRIAN E. MYERS is an Associate Professor in the Department of Agricultural Education and Communication at the University of Florida, 307A Rolfs Hall, P. O. Box 110540, Gainesville, FL 32611, bmyers@ufl.edu
An Analysis of FFA Chapter Demographics as Compared to Schools and Communities

Shannon Lawrence
John Rayfield
Lori L. Moore
Corliss Outley
Texas A&M University

This descriptive study was a special project for the National FFA Organization to determine the demographic makeup of rural, suburban, urban, and randomly selected at-large FFA chapters from the four national FFA regions. Summary data for this study revealed that gender in selected FFA chapters was 55% male and 45% female. Eighty percent of FFA members were reported to be White while the respective communities were 54% White. Rural FFA chapters had the highest percentage of FFA members in relation to their agricultural education course enrollments. Urban chapters reported more than half (52%) of their agricultural education students were FFA members. The majority of agricultural education teachers are White males. The demographic characteristics of FFA chapters in relation to their respective schools and communities provide a snapshot of today’s agricultural education programs and FFA chapters. Furthermore, this research could help identify strategies to move FFA chapters toward a more parallel representation of the schools and communities in which they exist.

Keywords: FFA chapter demographics, school demographics, community demographics

According to Talbert and Edwin (2008), diversity is one of the most “significant social aspects” (p. 51) in the United States because of the rapid change in demographics. Because of those rapid demographic changes, “opportunities to maintain a pipeline of future agriculturalists will depend on the ability of secondary agricultural education programs to attract students from non-traditional backgrounds” (Esters & Bowen, 2004, p. 25). Priority four of the national research agenda for agricultural education contains a scientific focus to “examine the role of diversity and multiple perspectives in meaningful learning across agricultural education contexts” (Doerfert, 2011, p. 9). Igo and White (1999) made a prediction that before the turn of the 21st century “future generations of FFA members will increasingly be urban, while the minority will be rural. Few will have a farm background, and even less will have family ties to production agriculture” (p. 9).

Even though the United States has become more racially/ethnically diverse and school populations around the nation have changed, school-based agricultural education programs have not (Bowen, 2002; LaVergne, Larke, Elbert, & Jones, 2011). Opportunities exist to increase agricultural education enrollment, FFA membership, and benefits to many students as the ethnic and racial composition in the United States changes rapidly (Roberts et al., 2009). Currently, “millions of students each year, from all ethnicities, are missing the numerous benefits provided through agricultural education and FFA” (Roberts et al., 2009, p. 70). Agricultural education should recognize the importance of recruiting students so the student body will “resemble the diversity of this country, of local communities, and of individual schools” (Roberts et al., 2009, p. 70) to ensure its future success.

Roberts et al. (2009) posited “the current demographics of FFA and agricultural education do not align with the 21st century ethnicity of many public schools” (p. 69). Few could argue that the recruitment of a diverse student population is not essential for a student organization to thrive (Brown, 2002). However, studies have shown there are many barriers that can preclude...
minority students from enrolling in agricultural education programs (Cano & Bankston, 1992; Connors, Moore, & Elliot, 1990; Gliem & Gliem, 2000; Hoover & Scanlon, 1991; LaVergne et al., 2011; Talbert & Larke, 1995; Warren & Alston, 2007).

According to National FFA statistics, as of 2010 there were 7,487 FFA chapters across the United States, Puerto Rico, and the Virgin Islands. Of these 7,487 chapters, the composition of members was 76% White, 16% Hispanic, 4% African-American, and 2% American Indian (National FFA, 2011a). According to the U.S. Census Bureau in 2010 the respective percentages for the U.S. population were 72.4%, 16.3%, 12.6% and 0.9%. While these statistics are similar, school districts may not be accurately represented by national statistics.

The members of FFA and other youth agricultural education programs along with graduates in agricultural education teacher education programs across the nation do not reflect the “ethnic influx” (Laverge et al., 2011, p. 140) that is occurring (Kantrovich, 2007; Rocca & Washburn, 2008; Talbert & Edwin, 2008; Talbert & Larke, 1995). Furthermore, LaVergne et al. found that “most agricultural educators are not enrolling in diversity/multicultural courses in an undergraduate academic program” (p. 147).

The field of agricultural education must begin to critically assess its recruitment, engagement, and retention of ethnically diverse youth or face the demise of the field in the future (Bowen, 2002). It is also important to study the demographics of the organization because having members with different perspectives, experiences, and knowledge will increase creative solutions to problems and increase the amount of available talent for filling important jobs in the workforce (Yukl, 2006).

The historical context of racial/ethnic agricultural teachers is not new. As late as 1963, the New Farmers of America (NFA), a national organization for Black farm boys enrolled in vocational agriculture, had reached a membership of more than 58,000 (Wakefield & Talbert, 2000). However, since the merge of NFA with Future Farmers of America in 1965, the enrollment of Black students declined to approximately 21,000 in 2011 (National FFA, 2011a).

The mission of the National FFA Organization is “dedicated to making a positive difference in the lives of young people by developing their potential for premier leadership, personal growth, and career success through agricultural education” (National FFA, 2011b). FFA provides leadership development, service-learning opportunities, and career preparation for all students enrolled in agricultural education programs. As FFA members and agricultural education program’s students graduate and move on to post-secondary school or the workforce, they could potentially enter an area more diverse than where they attended high school.

Leventhal (1999) claimed “that students involved with vocational student organizations [VSOs] are likelier to be involved in community affairs and organizations, school organizations, church groups, etc.” (p. 24). If FFA members are indeed more likely to be involved with their local communities, one may be led to think the FFA chapter would reflect the community demographic makeup. More research is needed before this assertion can be made.

A study conducted by Gliem and Gliem in 2000 reported significantly more non-FFA members were Asian, Black, and Hispanic than were FFA members. A significant number of non-FFA members also responded they did not realize how agriculture directly or indirectly affects their lives and their community (Gliem & Gliem, 2000). Is there a disconnect between FFA chapter membership and local communities? Roberts et al. (2009) assumed there was a disconnect present in three schools in San Antonio. Their study revealed that one school had a 722% increase in Hispanic enrollment in agricultural education and a 350% increase in FFA membership during the three-year implementation of tailored recruitment programs. Perhaps a school-by-school approach to increasing diversity of FFA chapters and agricultural education programs is an effective and efficient model for agricultural education.

Researchers have conducted numerous studies regarding diversity in agricultural education (Bowen, 2002; Esters & Bowen, 2004; Gliem & Gliem, 2000; Kantrovich, 2007; LaVergne et al., 2011; Roberts et al., 2009; Rocca & Washburn, 2008; Talbert & Edwin, 2008; Talbert & Larke, 1995; Wakefield & Talbert, 2000). Bowen
(2002) challenged the field of agricultural education to develop strategies to recruit a new ethnically diverse pool of agricultural teachers or face irrelevancy in the future. More than 10 years have passed since Bowen (2002) issued his challenge. Has the profession specifically tied to FFA heeded Bowen’s warnings in 2001 and begun to change? This study sought to describe demographic characteristics of FFA chapters and FFA advisors to benchmark the status of selected programs within the schools and communities they reside to give insight to professionals involved with FFA.

**Purpose and Objectives**

The purpose of this study was to determine the demographic characteristics of selected FFA chapters in the United States as well as the schools and communities in which these chapters exist. The following objectives were used to guide this study:

1. Describe selected FFA chapters in terms of selected demographic characteristics.
2. Describe the schools in which the selected FFA chapters exist in terms of selected demographic characteristics.
3. Describe the communities in which the selected FFA chapters exist in terms of selected demographic characteristics.
4. Describe the demographic characteristics of lead FFA advisors in selected FFA chapters.

**Methodology**

**Population and Sample**

The population of interest for this study consisted of three groups: (1) rural, suburban, and urban (as defined by the U.S. Census Bureau) FFA chapters from the four National FFA regions; (2) schools in which these FFA chapters exist; and (3) communities in which the schools are located. A list of all chartered FFA chapters was obtained from the National FFA Organization. The chapters were sorted into four lists based on the four recognized regions: Central Region, Eastern Region, Southern Region, and Western Region. Chapters within each region were then categorized according to population density as rural (areas of less than 2,500 people), suburban (U.S. Census Bureau urban clusters of between 2,500 and 50,000 people), or urban (U.S. Census Bureau urban areas of 50,000 or more people). Microsoft Excel® and zip code population data obtained from the U.S. Census Bureau were used to categorize the FFA chapters. Categorized email addresses became panel groups and were loaded into Qualtrics, an online survey provider utilized by Texas A&M University.

An email invitation was sent to all FFA chapters (N= 7,418) with a valid email address via Qualtrics. Three hundred forty–six responses were obtained from the email invitation. Stratified random sampling (Ary, Jacobs, & Razavieh, 1996; Isaac & Michael, 1997) was used to select the 128 FFA chapters and corresponding schools and communities to be included from the 346 responses received from the convenience sample. Stratified random sampling allowed the researchers to represent both the overall population and key subgroups such as regions and population density areas while simultaneously providing a more representative sample of the entire population of FFA chapters (Ary, Jacobs, & Razavieh, 1996).

The rural, suburban, and urban population density categories within each region served as the strata or subgroups. Within each strata of each region, eight chapters were randomly selected for inclusion in the study from those who replied to the request for participation. Thus, eight rural chapters from each of the four regions (32 rural chapters total), eight suburban chapters from each of the four regions (32 suburban chapters total), eight urban chapters from each of the four regions (32 urban chapters total), and eight at-large chapters from each of the four regions (32 at-large chapters total) were included in the study. One hundred twenty-eight FFA chapters and their corresponding schools and communities were selected for the study (see Table 1).
Table 1
*FFA Chapters, Schools, and Communities Selected for Inclusion in the Study*

<table>
<thead>
<tr>
<th>Region</th>
<th>Rural</th>
<th>Suburban</th>
<th>Urban</th>
<th>At-Large</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Central</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>32</td>
</tr>
<tr>
<td>Eastern</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>32</td>
</tr>
<tr>
<td>Southern</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>32</td>
</tr>
<tr>
<td>Western</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>32</td>
</tr>
<tr>
<td>Total</td>
<td>32</td>
<td>32</td>
<td>32</td>
<td>32</td>
<td>128</td>
</tr>
</tbody>
</table>

**Data Collection and Analysis**

Selected demographic characteristics were collected at three different levels: (1) FFA chapter, (2) school, and (3) community. At the chapter level, the lead FFA advisor reported demographics for his or her program. A lead FFA advisor was operationally defined as the teacher in charge of the managerial duties for each local FFA chapter. Data collected included agricultural education program enrollment, number of FFA members, FFA member gender, and FFA member ethnicity. Lead FFA advisor gender and ethnicity were collected from direct contacts via email and/or phone.

School level demographic data for student gender and ethnicity were collected from statistics available on the National Center for Educational Statistics (NCES) website, State Department of Education websites (including School Report Card), high-schools.com, and schooltree.org. Community level demographic data for gender and ethnicity were obtained from the NCES website and city-data.com. Data were analyzed using Microsoft Excel. Descriptive statistics were used to accomplish the objectives of the study.

**Results**

Summary findings for agricultural education program enrollment, FFA chapter membership, teacher demographics, and gender and ethnicity of FFA chapters and their respective schools and communities are described and discussed based on the strata used in the study.

**Rural Chapters**

Summary data for the gender and ethnicity within the 32 rural chapters and the respective schools and communities are presented in Table 2. The average number of students in the agricultural education programs in these 32 chapters was 73.81 and the average number of FFA members was 52.59. Therefore, on average, 71.25% of students enrolled in agricultural education in this study’s 32 rural chapters were FFA members. Thirty-one of the 32 FFA chapters had one FFA advisor and the remaining chapter had two FFA advisors yielding an average of 1.03 FFA advisors per chapter. Twenty-six of the 32 lead FFA advisors were male and six were female. All 32 lead FFA advisors were White.
Table 2
Summary of Gender and Ethnicity for Selected Rural FFA Chapters and their Respective Schools and Communities (n = 32)

<table>
<thead>
<tr>
<th>Demographic Characteristic</th>
<th>FFA Chapter</th>
<th>School</th>
<th>Community</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>684</td>
<td>42.48</td>
<td>3,842</td>
</tr>
<tr>
<td>Male</td>
<td>926</td>
<td>57.52</td>
<td>4,094</td>
</tr>
<tr>
<td>Ethnicity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asian/Pacific Islander</td>
<td>2</td>
<td>0.12</td>
<td>139</td>
</tr>
<tr>
<td>Black</td>
<td>29</td>
<td>1.71</td>
<td>835</td>
</tr>
<tr>
<td>Hispanic</td>
<td>153</td>
<td>9.02</td>
<td>1,227</td>
</tr>
<tr>
<td>Native American</td>
<td>6</td>
<td>0.35</td>
<td>29</td>
</tr>
<tr>
<td>Other</td>
<td>0</td>
<td>0.00</td>
<td>53</td>
</tr>
<tr>
<td>White</td>
<td>1,506</td>
<td>88.80</td>
<td>6,439</td>
</tr>
</tbody>
</table>

Note. Unreported gender and ethnicity data were not included in summary analysis.

Suburban Chapters

Summary data for the gender and ethnicity within the 32 suburban chapters and the respective schools and communities are presented in Table 3. The average number of students in the agricultural education programs in these 32 chapters was 123.09, and the average number of FFA members was 84.03. Therefore, on average, 68.27% of students enrolled in agricultural education in this study’s 32 suburban chapters were FFA members. There were 46 FFA advisors for these 32 chapters yielding an average of 1.44 FFA advisors per chapter. Twenty of the 32 lead FFA advisors were male, and 12 were female. Twenty-nine of the lead FFA advisors were White, one was Native American, one was Black, and one was Hispanic.

Table 3
Summary of Gender and Ethnicity for Selected Suburban FFA Chapters and their Respective Schools and Communities (n = 32)

<table>
<thead>
<tr>
<th>Demographic Characteristic</th>
<th>FFA Chapter</th>
<th>School</th>
<th>Community</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>1,265</td>
<td>45.70</td>
<td>10,820</td>
</tr>
<tr>
<td>Male</td>
<td>1,503</td>
<td>54.30</td>
<td>11,490</td>
</tr>
<tr>
<td>Ethnicity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asian/Pacific Islander</td>
<td>9</td>
<td>0.32</td>
<td>168</td>
</tr>
<tr>
<td>Black</td>
<td>125</td>
<td>4.51</td>
<td>1,748</td>
</tr>
<tr>
<td>Hispanic</td>
<td>167</td>
<td>6.02</td>
<td>3,084</td>
</tr>
<tr>
<td>Native American</td>
<td>138</td>
<td>4.97</td>
<td>1,047</td>
</tr>
<tr>
<td>Other</td>
<td>1</td>
<td>0.04</td>
<td>10</td>
</tr>
<tr>
<td>White</td>
<td>2,334</td>
<td>84.14</td>
<td>16,260</td>
</tr>
</tbody>
</table>

Note. Unreported gender and ethnicity data were not included in summary analysis.
Urban Chapters

Summary data for gender and ethnicity within the 32 urban chapters and their respective schools and communities are presented in Table 4. The average number of students in the agricultural education programs in these 32 chapters was 149.09, and the average number of FFA members was 77.94. Therefore, on average, 52.27% of students enrolled in agricultural education in this study’s 32 urban chapters were FFA members. There were 38 FFA advisors in these 32 chapters yielding an average of 1.19 FFA advisors per chapter. Of the 32 lead FFA advisors, 17 were male, 14 were female, and one did not report their gender. Of the 32 lead advisors, 30 were White, one was a Native American, and one was Hispanic.

Table 4
Summary of Gender and Ethnicity for Selected Urban FFA Chapters and their Respective Schools and Communities (n = 32)

<table>
<thead>
<tr>
<th>Demographic Characteristic</th>
<th>FFA Chapter</th>
<th>School</th>
<th>Community</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>f</td>
<td>%</td>
<td>f</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>1,117</td>
<td>49.53</td>
<td>21,519</td>
</tr>
<tr>
<td>Male</td>
<td>1,138</td>
<td>50.47</td>
<td>22,880</td>
</tr>
<tr>
<td>Ethnicity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asian/Pacific Islander</td>
<td>42</td>
<td>1.65</td>
<td>1,577</td>
</tr>
<tr>
<td>Black</td>
<td>173</td>
<td>6.81</td>
<td>6,662</td>
</tr>
<tr>
<td>Hispanic</td>
<td>643</td>
<td>25.31</td>
<td>9,387</td>
</tr>
<tr>
<td>Native American</td>
<td>25</td>
<td>0.98</td>
<td>598</td>
</tr>
<tr>
<td>Other</td>
<td>7</td>
<td>0.28</td>
<td>180</td>
</tr>
<tr>
<td>White</td>
<td>1,650</td>
<td>64.96</td>
<td>26,013</td>
</tr>
</tbody>
</table>

Note. Any unreported gender and ethnicity data were not included in summary analysis.

At-Large Chapters

Summary data for gender and ethnicity within the 32 at-large chapters and their respective schools and communities are presented in Table 5. The average number of students in the agricultural education programs in these 32 chapters was 102.72 and the average number of FFA members was 64.78. Therefore, on average, 63.07% of students enrolled in agricultural education in this study’s 32 at-large chapters were FFA members. There were 38 FFA advisors in these 32 chapters yielding an average of 1.19 FFA advisors per chapter. Of the 32 lead FFA advisors, 27 were male and five were female. Thirty of the 32 lead FFA advisors were White, one was Hispanic, and one did not report ethnicity.
Table 5
Summary of Gender and Ethnicity for Selected At-Large FFA Chapters and their Respective Schools and Communities (n = 32)

<table>
<thead>
<tr>
<th>Demographic Characteristic</th>
<th>FFA Chapter</th>
<th>School</th>
<th>Community</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>f</td>
<td>%</td>
<td>f</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>887</td>
<td>41.28</td>
<td>9,037</td>
</tr>
<tr>
<td>Male</td>
<td>1,262</td>
<td>58.72</td>
<td>9,364</td>
</tr>
<tr>
<td>Ethnicity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asian/Pacific Islander</td>
<td>5</td>
<td>0.23</td>
<td>136</td>
</tr>
<tr>
<td>Black</td>
<td>52</td>
<td>2.39</td>
<td>1,069</td>
</tr>
<tr>
<td>Hispanic</td>
<td>186</td>
<td>8.54</td>
<td>3,444</td>
</tr>
<tr>
<td>Native American</td>
<td>32</td>
<td>1.47</td>
<td>165</td>
</tr>
<tr>
<td>Other</td>
<td>5</td>
<td>0.23</td>
<td>6</td>
</tr>
<tr>
<td>White</td>
<td>1,897</td>
<td>87.14</td>
<td>13,701</td>
</tr>
</tbody>
</table>

Note. Unreported gender and ethnicity data were not included in summary analysis.

All Chapters

Summary data for gender and ethnicity within the 128 chapters selected for inclusion in this study and their respective schools and communities are presented in Table 6. The average number of students in the agricultural education programs in these 128 chapters was 112.18 and the average number of FFA members was 69.83. Therefore, on average, 62.25% of all students enrolled in the agricultural education programs in this study’s 128 chapters were FFA members. There were a total of 155 FFA advisors from the 128 chapters yielding an average of 1.21 FFA advisors per chapter.

Table 6
Summary of Gender and Ethnicity for Selected FFA Chapters and their Respective Schools and Communities (N =128)

<table>
<thead>
<tr>
<th>Demographic Characteristic</th>
<th>FFA Chapter</th>
<th>School</th>
<th>Community</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>f</td>
<td>%</td>
<td>f</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>3,926</td>
<td>45.05</td>
<td>45,218</td>
</tr>
<tr>
<td>Male</td>
<td>4,789</td>
<td>54.95</td>
<td>47,810</td>
</tr>
<tr>
<td>Ethnicity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asian/Pacific Islander</td>
<td>58</td>
<td>0.63</td>
<td>2,020</td>
</tr>
<tr>
<td>Black</td>
<td>379</td>
<td>4.13</td>
<td>10,314</td>
</tr>
<tr>
<td>Hispanic</td>
<td>1,149</td>
<td>12.51</td>
<td>17,142</td>
</tr>
<tr>
<td>Native American</td>
<td>201</td>
<td>2.19</td>
<td>1,839</td>
</tr>
<tr>
<td>Other</td>
<td>13</td>
<td>0.14</td>
<td>249</td>
</tr>
<tr>
<td>White</td>
<td>7,387</td>
<td>80.41</td>
<td>62,413</td>
</tr>
</tbody>
</table>

Note. Unreported gender and ethnicity data were not included in summary analysis.
FFA Membership and Agricultural Education Enrollment

Summary data for agricultural education program enrollment and FFA membership by population classification are presented in Table 7. In rural chapters, 71.25% of students enrolled in agricultural education were FFA members. In suburban chapters, 68.27% of students enrolled in agricultural education were FFA members. In urban chapters, 52.27% of students enrolled in agricultural education were FFA members. In the chapters selected at-large, 63.07% of students enrolled in agricultural education were FFA members. Overall, 62.25% of students enrolled in agricultural education courses were FFA members. However, it must be noted that some chapters reported more FFA members than students enrolled in agricultural education. This could be explained if the school was on a block schedule, if the chapter had post-graduation members, and if students prepaid dues for the following semester when they would be enrolled in an agricultural education course.

Table 7
Summary of Agricultural Education Enrollment and FFA Membership by Population Classification

<table>
<thead>
<tr>
<th>Population Classification</th>
<th>Agricultural Education Students</th>
<th>FFA Members</th>
<th>Percentage of FFA Members</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rural Chapters</td>
<td>2,362</td>
<td>1,683</td>
<td>71.25</td>
</tr>
<tr>
<td>Suburban Chapters</td>
<td>3,939</td>
<td>2,689</td>
<td>68.27</td>
</tr>
<tr>
<td>Urban Chapters</td>
<td>4,771</td>
<td>2,494</td>
<td>52.27</td>
</tr>
<tr>
<td>At-Large Chapters</td>
<td>3,287</td>
<td>2,073</td>
<td>63.07</td>
</tr>
<tr>
<td>National Totals</td>
<td>14,359</td>
<td>8,939</td>
<td>62.25</td>
</tr>
</tbody>
</table>

FFA Advisors

Summary data for gender and ethnicity of the 128 lead FFA advisors by population classification are shown in Table 8. More than one-half of the teachers in each population classification were White males. In the rural chapters, more than three-quarters of the lead FFA advisors were White males (n = 28, 87.50%). Of the 31 lead FFA advisors in the suburban chapters who reported gender and ethnicity, slightly more than half (n = 17, 54.84%) were White males. Of the 31 lead FFA advisors who reported gender and ethnicity in the urban chapters, slightly more than half (n = 16, 51.61%) were White males. In the at-large chapters, slightly more than three-quarters (n = 25, 78.13%) of the lead FFA advisors were White males.

Table 8
Summary of Lead FFA Advisor Gender and Ethnicity by Population Classification

<table>
<thead>
<tr>
<th>Gender/Ethnicity</th>
<th>Rural Chapters</th>
<th>Suburban Chapter</th>
<th>Urban Chapters</th>
<th>At-Large Chapters</th>
<th>All Chapters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>4</td>
<td>12</td>
<td>14</td>
<td>5</td>
<td>35</td>
</tr>
<tr>
<td>White</td>
<td>4</td>
<td>12</td>
<td>14</td>
<td>5</td>
<td>35</td>
</tr>
<tr>
<td>Male</td>
<td>28</td>
<td>20</td>
<td>17</td>
<td>27</td>
<td>92</td>
</tr>
<tr>
<td>Black</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Hispanic</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Native American</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>White</td>
<td>28</td>
<td>17</td>
<td>16</td>
<td>25</td>
<td>86</td>
</tr>
<tr>
<td>Unreported ethnicity</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Unreported Gender</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Native American</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>
Conclusions, Recommendations and Implications

Caution should be used when interpreting self-reported data collected from numerous sources. This study was purely descriptive in nature. No inferences should be made beyond the scope of this study based on these findings. Caution must be taken in interpreting the results of this study due to the nature of convenience sampling techniques. The most telling conclusion was there are few centralized sources of demographic data for FFA chapters. In fact, there was no single source containing all of the demographic data of interest. As a result, compiling summary data that truly portrays all FFA chapters and their respective schools and communities across the country was challenging.

A panel of university faculty deemed public sources of information appropriate for the research project. Utilizing available public access information was useful and could prove valuable for other researchers who wish to replicate the study or further investigate the findings of this study. Additionally, agricultural education teachers provided adequate responses, but it is important to remember that these were self-reported data from the lead agricultural education teachers. The researchers assumed the teachers answered honestly and objectively.

Gender

Overall, there were more males in the 128 selected FFA chapters ($n = 4789, 54.95\%$) and their respective schools ($n = 47,810, 51.39\%$) and communities ($n = 775,904, 50.94\%$) than females. However, when looking at the different population categories (rural, suburban, urban), there were some trends of interest. The overall trend was female FFA members became more prevalent the more urbanized the area became. Thus, the highest percentage of female members ($49.53\%$) was present in urban areas representing an $11\%$ increase above what was reported on the National FFA Organization (2011a) website for overall female membership. Are males drawn to rural programs more readily than females? Are females more likely to join FFA in urban programs? Are these questions true for all urban areas, or do regions have an effect on demographic makeup? These questions require further investigation and could offer insight into tailored recruitment strategies for FFA chapters as reported in Roberts et al. (2009).

Ethnicity

Ethnicity percentages changed between the categories of chapter, school, and community. The overall results indicate FFA chapters were $80.41\%$ White, $12.51\%$ Hispanic, $4.13\%$ Black, $2.19\%$ Native American, $0.63\%$ Asian/Pacific Islander, and $0.14\%$ Other. Although Roberts et al. (2009) reported that agricultural education and the National FFA Organization can be appealing to Hispanic students, the percentage of Hispanic students remains low.

According to available data sources, greater heterogeneity was present in the school and community than was present in the FFA chapters in this study. However, as population increased so did the heterogeneity of FFA chapter members. While it was unclear exactly why this phenomenon took place, one could hypothesize that it was due to more diverse populations being in urban areas. Nonetheless, these findings support Bowen (2002) that school populations have become more racially/ethnically diverse, but school-based agricultural education programs do not reflect the level of diversity found in their respective schools.

FFA Membership and Agricultural Education Enrollment

Summary data of agricultural education enrollment and FFA membership by population categories revealed interesting trends for this study. However, it must be noted that the data reported in the study for agricultural education program enrollment and FFA membership were self-reported by the lead FFA advisor. Additionally, some advisors reported more FFA members than students enrolled in their agricultural education program, which could be explained through block scheduling or having post-graduation FFA members working toward their American FFA Degree.

Of the agricultural education programs sampled, the summary data for agricultural education enrollment and FFA membership by pop-
ulation classification validated what some might assume to be true about an organization devoted to agriculture: Rural communities sampled had the highest percentage of FFA membership at 71%. However, suburban communities closely followed at 68% and at-large communities had 63% FFA membership. Urban communities in this study had the lowest percentage of FFA membership at 52%.

Although there has been expansion of agricultural education programs in suburban and urban areas, based on percentages, these findings do not currently support Igo and White (1999). The results of this study could, however, represent areas of membership growth potential just as Roberts et al. posited in 2009. If the National FFA Organization plans to increase membership substantially, more focus could be placed on the development of recruitment strategies and stakeholder buy-in campaigns for suburban and urban agricultural education programs. Strategies that focus on parents in urban areas as suggested by Esters and Bowen (2004) could also help increase both the numbers of FFA members and their diversity.

FFA Advisors

A snapshot of the FFA advisors or the teacher recognized as the lead FFA advisor in the agricultural education program from the 128 programs revealed that the majority (68.25%) were White males (n = 86). This aligns with Talbert and Larke’s (1995) findings that the majority of agricultural education teachers are White males. Thirty-five advisors (27.78%) in this study were White females. There were three Hispanic males, one Black male and one Native American male serving as lead FFA advisors in the selected chapters. All female lead advisors in the 128 FFA chapters reported in this study were White females. There were more females advising FFA chapters in urban (n = 14) and suburban (n = 12) settings than in rural (n = 4) locations. Bowen (2002) stated that our field must develop strategies to recruit an ethnically diverse pool of agricultural teachers or face irrelevancy in the future. Warren and Alston (2007) pointed out that both students and teachers can benefit from the inclusion of ethnic minorities and women in the profession. Further investigation is needed to determine if and why females are teaching agricultural education and advising FFA chapters with a higher frequency in urban and suburban areas than in rural areas.

Results of this study provided insight into the makeup of FFA chapters across the nation and how they reflect the school and communities in which they exist. FFA chapters were predominately White and relatively evenly split in terms of gender. Wakefield and Talbert (2000) suggested that the decline among Black students in youth programs was because too few students are interested in and were accepted into agricultural programs as well as the decline in hiring of minority agricultural education teachers. FFA chapters led by advisors who were not White did not represent the ethnic makeup of the school or community. The main concern that arose from these findings was why do FFA chapters not closely mirror the schools and communities they reside in? Additional time, resources, and research should be devoted to further investigation.

Recommendations for Practice

The following questions may apply to agricultural education teachers, state agricultural education staff, agricultural education teacher education faculty, key industry stakeholders and National FFA staff as a means of stimulating discussion about how to further agricultural education’s future.

1) Should agricultural education teachers receive professional development on how to recruit and retain increased numbers of diverse students?

2) Should National/State FFA explore more opportunities to recognize chapters who excel in both recruitment of diverse members and accomplishment of the FFA mission?

3) Could creating and incentivizing an accurate reporting system (state or national) help agriculture teachers accurately report demographic information to National FFA?

4) Should round-table discussions at yearly meetings be developed to strategize about ways to further investigate and
Recommendations for Future Research

There are many different avenues for future research based on demographic characteristics of youth involved in FFA. The following are examples of projects and questions that could advance the study of diversity and expand FFA membership.

1) Through survey research and collaboration with AAAE Member Institutions, NAAE, and National FFA, a national database of valid email addresses for agricultural education teachers could be developed and maintained to provide an accessible population for future research regarding the demographic composition of agricultural education programs.

2) How do the demographic characteristics of agricultural education teacher affect the demographic makeup of the FFA chapter?

3) Do urban FFA chapters have a significantly lower percentage of FFA members than other chapters?

4) Why do few ethnically diverse men or women choose/not choose careers as agricultural education teachers?

5) Are female students more likely to join a rural, suburban, or urban FFA chapter?

6) Explore non-agricultural education and agricultural education student perceptions of FFA in rural, suburban, and urban chapters.

7) Explore teacher perceived barriers to recruitment of diverse students.

Agricultural education has a far-reaching history. As the future materializes ahead of stakeholders involved in agricultural education, expanding the diversity of the program is not an option, it is a necessity (Bowen, 2002; Gliem & Gliem, 2000). Furthermore, if FFA program leaders do not try to “appeal to the new ‘consumer’, then they will become inconsequential in the school environment … more importantly, a segment of young men and women will miss out on the rich opportunities agriculture and the FFA holds for them” (Jahnke, 2011, para. 9).

References


SHANNON LAWRENCE is an Instructor in the Agricultural Education Department at Clemson University, 253 McAdams, Clemson, SC, 29634, sglawre@clemson.edu.

JOHN RAYFIELD is an Assistant Professor in Agricultural Leadership, Education, and Communications at Texas A&M University, MS 2116 TAMU, College Station, TX 77843-2116, jrayfield@tamu.edu.

LORI L. MOORE is an Assistant Professor in Agricultural Leadership, Education, and Communications at Texas A&M University, MS 2116 TAMU, College Station, TX 77843-2116, llmoore@tamu.edu.

CORLISS OUTLEY is an Associate Professor in the Department of Recreation, Park, and Tourism Sciences at Texas A&M University, AGLS 427, College Station, TX 77843, coutley@tamu.edu.

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