The Effectiveness of Women’s Agricultural Education Programs: A Survey from Annie’s Project

Lynn Hambleton Heins, Agriculture Business Specialist  
*University of Missouri Extension*
Jeff Beaulieu, Department Chair/Associate Professor  
*Southern Illinois University*
Ira Altman, Assistant Professor  
*Southern Illinois University*

This study determined the effectiveness of ‘Annie’s Project—Education for Farm Women’ in improving women’s skill sets. Illinois farm women who participated in Annie’s Project were given a pre-test or baseline survey which measured farming practices in the five areas of risk (production, marketing, financial, legal and human resource). The women were later resurveyed. The main methodology to measure improvement in skill is calculated by the difference in the percentage of ‘yes’ responses from the baseline to the post-test. Results suggest an overall increase of 10.92 percent with the largest improvement occurring in the financial area of risk. In general, the differences in ‘yes’ responses were found to be significantly different from zero. Regression analysis was also performed to determine whether socio-economic variables, such as marital status and farm size, play a role in the difference in the percentages of ‘yes’ responses.

Keywords: farm women, educational programs, annie’s project

**Introduction**

Educational outreach programs for farm women are becoming more prevalent throughout the United States. The Alaskan Women in Timber, the Minnesota Agri–Women and the University of Vermont’s Women’s Agricultural Network are just a few of a growing number of outreach programs. The central research question for this research is: are these programs effective in increasing the skills of farm women? A secondary research question is: are any socio-economic variables essential in explaining who could benefit from educational programs?

This study focuses on one program known as ‘Annie’s Project—Education for Farm Women’ as an example. The main purpose of this article will be to assess the effectiveness of Annie’s Project by considering the extent to which Illinois women’s skill sets improved as a result of participating in the program. The paper includes the following: literature review and conceptual model, purpose and objectives, program description, research methods and data, survey results and conclusion. The methods and results rely on a statistical review of survey responses based upon analysis of mean, variance and multiple regression. Results indicate a significant increase in women’s skill sets. There is some evidence from regression analysis, but highly inconclusive, that socio-economic factors may play a role in the skills gained by women participating in Annie’s Project. It is more likely that the increase in skill sets occur regardless of socio-economic factors.

**Literature Review and Conceptual Model**

For a variety of factors, the role of women in agriculture is increasing. A brief review of the literature showed that the role of women is indeed increasing but the reasons for this increase are complex. The main purpose for this paper is more modest than fully understanding the causes of women’s role in agriculture; it is to evaluate educational programs, such as Annie’s
Project, that might help educate women for increased production and financial management of farms. Regardless of the reasons for the increase, educational programs need evaluation. However, the reading of the literature helps inform the authors’ underlying conceptual model.

According to the 2002 US Census of Agriculture, women farm operators increased more than 13 percent between 1997 and 2002. Furthermore, the number of acres operated primarily by females increased by 16.5 percent. This evidence continues a trend established during the 1980’s. Between 1980 and 1990, farm sales and real estate values plummeted, causing the most recent farm crisis (Lobao & Meyer, 2001). It was during this crisis that women’s participation in farm production and financial management increased dramatically. On the other hand, other authors argue the role of women in agriculture has always been significant but invisible (Sachs, 1983; Whatmore, 1990).

Empirical studies have suggested that one should expect women’s involvement in farm management to increase when profitability diminishes and when farm size becomes smaller (Barry & Yoder, 2002; Buttel & Gillespie, 1984). The increased trend in women’s involvement in production and financial management has also brought greater attention to gender divisions of labor and increased study in the literature. Others have argued that women’s role in agriculture will increase with alternative marketing and production methods (Trauger, 2004).

Literature on gender roles in agriculture also point to a significant and increasing role for women in agriculture. McGonigal (1993) studied the roles of New York farm women and found that more than 75 percent of the women helped with farm management decisions in addition to juggling an off–farm career and household duties. These and other contributions by farm women date back to the pioneer days; unfortunately, the extent to which women contributed at that time is unknown, mostly because the evidence comes from two–century-old letters or personal diaries (Alston, 1998).

Simpson (1998) reported that the nature of farm women’s work is usually associated with various production tasks, bookkeeping and household tasks, while men are more likely to be involved with the physical or structural aspects of the farm. As modern farms have evolved, production and financial management have increased in importance and have involved women more compared to traditional roles.

Motivations play a large role in the gender division of labor. Men are usually motivated by high incomes and material rewards, while women are found to be motivated by ‘the need for independence.’ Women seek recognition from others and desire to put their skills and knowledge to use (Hisrich & Brush, 1986).

Carmen Albright (2006) focused upon the changes in the roles of farm women and what these trends meant for researchers who are addressing the needs of local farm women. She noted that educators began to notice the rapidly changing roles for farm women in the mid-1980. At that time, conferences aimed to suit the changing needs of women began to emerge in some states. The demand for these conferences has continued to rise as the needs and roles of women have changed. In this article, Albright reviewed surveys conducted with women who attended the 2005 and 2006 Arkansas Women in Agriculture Conferences. Albright discovered that women who are involved in the agricultural community are more likely to be involved in multiple roles, such as leadership and decision making.

Based on the authors’ reading of the literature, causes for change in women’s roles on farms are complex. Yet the effectiveness of educational programs should be studied. This conceptual model is based on the fact that Annie’s Project, and educational programs in general, can increase women’s proficiency in five specific risk categories derived from the literature: marketing, financial, human resource, legal, and production.

**Purpose and Objectives**

Given that the role of women in managing farm operations is increasing and, further, that educational outreach programs for farm women are becoming more prevalent, the main objective is to evaluate one program popular in many farm states, Annie’s Project. Although the causal nature of changing roles in agriculture is complex, evaluating increasingly important educational programs is essential. A secondary objective is to determine the effectiveness of
Annie’s Program based on socio-economic factors that might help targeted educational programming in the future.

Program Description

Annie’s Project was founded in 2002. The initial grant funding for Annie’s Project was obtained from Outreach and Assistance for Socially Disadvantaged Farmers and Ranchers (OASDFR), a United States Department of Agriculture initiative. Significant funding was also provided by the North Central Risk Management Education Center located in Lincoln, Nebraska. The main objective of OASDFR is to provide outreach and assistance activities which enable minority farmers to own and operate farm and ranch businesses successfully (Dismukus, 1997).

The mission of Annie’s Project is “to empower farm women to be better business partners through networks and by managing and organizing critical information” (Eggers 2002). The target audience for the program is farm women who have a passion for business and a desire to be involved. More than 4,800 farm women from 25 states have enrolled in the Annie’s Project program. The average age of these women is 46.7 years with a reported average of 18 years farm experience. The average number of acres operated for all participants is 613 acres. Nationally, 67 percent of the women reported farm income greater than $150,000. Eighty-six percent of the farm enterprises are arranged as sole proprietorships. Most of the women, 76 percent, are married, and 17 percent are single. Widowed and divorced women account for 7 percent of Annie’s Project participants. Thus Annie’s Project participants vary widely in demographics and are from diverse backgrounds.

Annie’s Project, along with many women’s educational programs, is a fairly new endeavor. There is a practical need for research to determine the effectiveness, or impact, of these newly emerging programs, and sponsors such as OASDFR could benefit from this knowledge.

Methodology and Data

Annie’s Project is designed specifically to empower women by providing the necessary tools and networks which are vital to running a successful operation. Teo (1996) found that successful businesswomen have access to current technology, training, and other educational programs. The authors hypothesize that Annie’s Project is increasing women’s proficiency in five specific risk categories derived from the literature: marketing, financial, human resource, legal, and production.

The methodology used to explore this hypothesis is a comparison of survey responses. These responses were generated from a pre-test survey administered during the first session of each Annie’s Project program and identical post-tests mailed at least six months after the completion of the program. Post-test surveys were mailed to every Illinois Annie’s Project participant who participated between 2004 and 2007. Of the 190 participants, 92 returned the post-test, representing a 48.4 percent response rate. The identical surveys were structured into two distinct parts. First, socio-economic descriptors establish age, number of children, marital status, farm size, years of experience, business structure, and income. The second part of the survey consists of 49 ‘yes’ or ‘no’ questions which inquire about the individual’s business acumen in the five risk categories.

Married women accounted for 82 percent of the Illinois Annie’s Project participants, followed respectively by widowed (10 percent), single (4 percent), and divorced (4 percent). Married participation was slightly higher than the national averages reported earlier as was that of widowed participation. The average age of the participants was 48.9 years with 23 years of farm experience, both higher than the national average. Average family size was three children. The average number of acres owned is 406. In Illinois, 40 percent of the women reported farm income of greater than $150,000. Both these measures of farm size are smaller than the national average of Annie’s Project participants. As was the case with national participants, the greater proportion of farm businesses represented, about 67 percent, were in sole proprietorships. Approximately 87 percent of the women were from crop production farms while 43 percent help manage livestock farms.

Table 1 shows the changes in ‘yes’ responses for eight selected questions that relate to the five risk areas: marketing, financial, human resource, legal, and production.
The first item in the table, production records, relates to a production area question, *do you keep production records such as yields, hundredweight sold, inventories, etc.?* Seventy percent reported keeping such records on the pre–test while 83.7 percent responded ‘yes’ on the post–test. The difference of 13.7 percentage points is assumed to be a result of participating in Annie’s Project and applying the learned skills to the production operation.

The second item in Table 1, market plan, is related to a specific market planning question: *do you have a written marketing plan?* An astonishing 90 percent of the pre–test participants reported not having written marketing plans. The number of respondents who implemented marketing plans as a result of taking the program increased by 12.8 percentage points.

Financial related questions ask whether the participant prepares annual balance sheets and income statements. Approximately 56 percent prepared balance sheets and 43 percent prepared income statements at the time of the pre–test. These percentages increased by 21.4 percentage points and 25.3 percentage points, respectively. Comfort with the farm’s level of debt increased by 18.5 percentage points. The increase for this question is interesting because the amount of debt most likely stayed the same in the short period between pre- and post–testing. It is likely women became more comfortable with the debt level as a result of program participation and acquiring a better understanding of the borrowing process.

Additional questions dealt with human resources and were both legal- and family-oriented. The ‘yes’ response to *‘do you have a plan for passing your business to the next generation?’* had a difference of 18.8 percentage points. Participants increased ownership of personal life insurance policies by about six percentage points. A similar number of participants implemented a will as a result of Annie’s Project.

A comparison of pre–test and post–test ‘yes’ responses by risk category are summarized in Table 2. For all risk categories, the proportion of ‘yes’ responses increased. The largest impact is in the financial category with a difference in ‘yes’ responses of 15.58 percentage points. The category with the smallest impact is the production category with a change of 5.18 points. This result is consistent with the findings from Simpson et al. (1998), who reported that women are more likely to contribute to bookkeeping tasks rather than physical production tasks. Women may have been more familiar with financial planning to begin with and, hence, more attuned to ways to improve such planning. Other categories which exhibited large increases in ‘yes’ responses are legal and human resources.
Table 2
Pre–test/Post–test Comparison by Risk Category and by Total

<table>
<thead>
<tr>
<th>Risk Category</th>
<th># of questions</th>
<th>Pre–test % Yes</th>
<th>Post–test % Yes</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Production</td>
<td>12</td>
<td>47.63%</td>
<td>52.81%</td>
<td>5.18%</td>
</tr>
<tr>
<td>Marketing</td>
<td>6</td>
<td>26.58%</td>
<td>35.33%</td>
<td>8.75%</td>
</tr>
<tr>
<td>Financial</td>
<td>15</td>
<td>56.74%</td>
<td>72.32%</td>
<td>15.58%</td>
</tr>
<tr>
<td>Legal</td>
<td>6</td>
<td>50.96%</td>
<td>64.67%</td>
<td>13.71%</td>
</tr>
<tr>
<td>Human Resources</td>
<td>10</td>
<td>49.21%</td>
<td>59.67%</td>
<td>10.46%</td>
</tr>
<tr>
<td>All Categories</td>
<td>49</td>
<td>48.57%</td>
<td>59.49%</td>
<td>10.92%</td>
</tr>
</tbody>
</table>

Survey Results

The extent that Illinois women’s skill sets improved in the five areas was measured by calculating the difference in the number of ‘yes’ responses from the baseline pre–test to the post–test. The authors assumed that an increase in ‘yes’ responses indicated an increase in skill level. Statistically significant increases in these skill levels would indicate that Annie’s Project is indeed effective. Statistical analysis of mean and variance in both responses and across individuals combined with a multiple regression framework to discover whether socio–economic descriptors contribute to the increase in ‘yes’ responses were explored.

It was hypothesized that there would be a statistically significant increase in the proportion of ‘yes’ responses. The results were reported for individual risk categories as well as across all categories combined. A similar hypothesis testing procedure was employed to gauge improvement in the mean of the individual increase in ‘yes’ responses. It was hypothesized that there would be a significant increase in the mean of individual ‘yes’ responses. It was further hypothesized that the individual variability in post–test ‘yes’ responses would significantly decrease from the pre–test. This decrease in variability would suggest that the overall content of the program is an effective means to improve the comprehensive extent to which Illinois women’s skill sets improved.

Hypothesis tests designed to determine whether the increase in ‘yes’ responses exhibited in Table 3 were performed on both responses (proportions) and across individuals (means and variance). These three tests were conducted for each category of risk and in total. The tests for proportions and individual mean responses were two–sample tests of hypothesis employing the Z–statistic. The two-sample test for variance employs the F–statistic. The results depicted in Table 3 indicate the increases in ‘yes’ responses are indeed statistically significant.

All but one of the comparisons are significant at least the 0.01 level of significance. The weakest link between Annie’s Project participation and the increase in ‘yes’ responses was in the production area. As discussed before this result is consistent with the findings from Simpson et al. (1998). The improvement in all other risk areas, and in total, is highly significant. The all-category decrease in the variances of ‘yes’ responses is significant at the .001 level, but this is not consistent across individual categories. Significant decreases in the variance were observed at the 0.05 level of significance in the production, financial, and legal risk areas. The decrease in variance in the marketing and human resources risk areas did not prove to be significant in this study. In view of Table 3, evidence suggests that Annie’s Project is an effective program.
Table 3
Significance Testing for Responses (Proportions) and Individuals (Means and Variance)

<table>
<thead>
<tr>
<th>Risk Category</th>
<th>% Change</th>
<th>Z (Proportions)</th>
<th>Z (Means)</th>
<th>F (Variance)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Production</td>
<td>5.18%</td>
<td>2.99**</td>
<td>2.07*</td>
<td>1.62**</td>
</tr>
<tr>
<td>Marketing</td>
<td>8.75%</td>
<td>3.57***</td>
<td>2.47**</td>
<td>0.91</td>
</tr>
<tr>
<td>Financial</td>
<td>15.58%</td>
<td>9.01***</td>
<td>6.95***</td>
<td>1.47*</td>
</tr>
<tr>
<td>Legal</td>
<td>13.71%</td>
<td>5.60***</td>
<td>5.15***</td>
<td>1.78***</td>
</tr>
<tr>
<td>Human Resources</td>
<td>10.46%</td>
<td>5.23***</td>
<td>4.72***</td>
<td>1.03</td>
</tr>
<tr>
<td>All Categories</td>
<td>10.92%</td>
<td>12.13***</td>
<td>6.73***</td>
<td>1.95***</td>
</tr>
</tbody>
</table>

*p < .05, **p < .01 ***p < .001

Multiple Regression Analysis

Barry and Yoder (2002) have demonstrated that socio-economic factors play an important role in defining both women’s roles and their level of participation in agriculture. A regression analysis was performed to determine if the socio-economic descriptors included in the first part of the survey impacted the difference in ‘yes’ responses between the pre-test and the post-test. Because of the confidential nature with which information was collected, the following procedure was introduced: Multiple random samples of the 190 pre-test survey responses were matched with the 92 post-test responses. This study will present the results of six of these. A backward linear regression elimination of independent variables routine was then applied to determine which socio-economic characteristics influenced the change in ‘yes’ responses. Backward linear regression analysis is a procedure in which all independent variables are considered in the beginning and then systematically removed one by one. The variable which gets removed first has the least correlation with the dependent variable. The removal process continued until none of the variables met the removal criterion. The significance level for independent variable removal was set at a 0.20 significance level to allow for a robust level of inference from the sample data.

The multiple regression model used represents a composite of demographic independent variables and is specified, in general terms, as:

\[ \Delta \text{Yes} = f(\text{IC, S, SB}) \]

where:

\[ \Delta \text{Yes} = \text{the change in ‘yes’ responses between the pre–test and post–test surveys.} \]

\[ \text{IC} = \text{individual characteristics developed from the pre–test survey demographic responses and includes age, years of experience, marital status, and number of children.} \]

\[ \text{S} = \text{size characteristics developed from the pre–test survey demographic responses and includes number of acres operated and categorical income levels specified as <$50,000; $50,001 to $150,000; $150,001 to $300,000; and >$300,000.} \]

\[ \text{SB} = \text{business structure characteristics developed from the pre–test survey. Farm business was classified categorically as sole proprietorship, partnership, S–Corporation or C–Corporation, Limited Liability Company, and other.} \]

In total there were 17 independent variables developed from the surveys. Four of these were discrete variables: age, years of experience, acres operated, and number of children. The remaining variables were categorical constructs representing marital status, income, and business structure. Table 4 presents the results of the backward elimination process for six random samples of the pre–test data.
A review of Table 4 does offer some insight into factors that may influence the success of Annie’s Project, but again, the evidence is not consistent for the random samples. Age appears in the final regression three out of six times. All three coefficients were significant at the 95 percent confidence interval. The negative signs suggest that, as age increases, the increase in ‘yes’ responses is smaller. Acres operated appears four times with one regression exhibiting a significance level at 0.10, and all four coefficients were negative, suggesting that, as farm size increases, the increase in ‘yes’ responses is smaller. In other words, older women and women from large farm operations are less impacted by the class than women from smaller operations. The number of children appears four times at a level of significance much like age, but all coefficients were positive, suggesting a positive relationship between children and number of ‘yes’ responses. In other words, as the number of children increases, the increase in ‘yes’ responses will increase. As may be recalled, many of the questions in the human resource risk area dealt with intergenerational issues such as planning to pass the farm down and developing a will. Further sampling did not offer any additional evidence that socio-economic factors play a consistent and significant role in gauging the effectiveness of Annie’s Project than offered here.

**Conclusions**

As the number of female principle operators continue to increase, we will most likely continue to see an increase in the demand for educational outreach programs for women such as ‘Annie’s Project—Education for Farm Women.’ This program offers extensive, hands-on training to women who have a desire to become better farm managers. The participants are from diverse backgrounds. For example, ages in the Illinois program range from 18 to 86 and computer skills range from no—experience to highly—experienced.

There is a need to study the effectiveness of educational outreach programs, particularly Annie’s Project as the program has extended to other Mid–Western states. This study determines the effectiveness of the program by examining the improvement in skill sets of Illinois farm women who have participated in the program.

The research question for this study inquires whether Annie’s Project is increasing women’s proficiency in farm business management in the five areas of risk: production, marketing, financial, legal, and human resources. Multiple
hypothesis tests performed across responses and individuals to gauge the effectiveness of the Annie’s Project were quite consistent. A significant increase in ‘yes’ responses appeared in all areas of risk and in total. The variability of responses also significantly decreased in total and for three out of five risk areas. The overall content of Annie’s program is an effective means to improve the comprehensive extent to which Illinois women’s skill sets improved. These results have important implications for OASDFR and other sponsors of these programs. Programs such as Annie’s Project should continue.

Multiple regression analysis was also undertaken to determine if socio–economic factors played a critical role in determining who benefited most from Annie’s Project. The evidence was inconclusive as class participants were not tracked as the identity of individuals was withheld in the post–test surveys. However, age, acres operated, and number of children may play a role in the benefit received by individual class participants. If the authors can speculate, the results suggest that younger women, from smaller farms, most likely with children, seemed to benefit to a greater degree from class participation. Hence the programs have a target audience to whom course materials can be structured. On the other hand, older women, likely from larger farms, did not experience the same degree of benefits as the increase in ‘yes’ responses diminished with age and farm size. Suggested here is that there may be unique needs in this population that need identification. It is the authors’ recommendation that, in order to conclusively determine the impact of socio–economic factors, a more structured sampling process that allowed for better tracking of individual specific responses would be required. The more evident and important conclusion however lies in the strength of the general hypothesis testing procedures outlined in this paper. Increases in skill sets likely occur regardless of socio–economic factors, and therefore programs like Annie’s Project will be beneficial to all participants regardless of socio–economic background.

References


LYNN HAMBLETON HEINS is a Master of Science in the Department of Agribusiness Economics at Southern Illinois University, 22902 Highway 3, Rockwood, IL 62280, HambletonL@missouri.edu

JEFF BEAULIEU is an Associate Professor and Interim Chair of the Department of Agribusiness, Southern Illinois University, Mail Code 4410, 1205 Lincoln Drive, Carbondale, Illinois 62901, jbeau@siu.edu

IRA ALTMAN is an Assistant Professor of Agribusiness at Southern Illinois University, Mail Code 4410, 1205 Lincoln Drive, Carbondale, Illinois 62901, ialtman@siu.edu
Agriscience Student Engagement in Scientific Inquiry: Representations of Scientific Processes and Nature of Science

Julie R. Grady, Assistant Professor
Arkansas State University
Erin L. Dolan, Associate Professor
George E. Glasson, Associate Professor
Virginia Polytechnic Institute and State University

Students’ experiences with science integrated into agriscience courses contribute to their developing epistemologies of science. The purpose of this case study was to gain insight into the implementation of scientific inquiry in an agriscience classroom. Also of interest was how the tenets of the nature of science were reflected in the students’ experiments. Participants included an agriscience teacher and her fifteen students who were conducting plant experiments to gain insight into the role of a gene disabled by scientists. Data sources included classroom observations, conversations with students, face-to-face interviews with the teacher, and students’ work. Analysis of the data indicated that the teacher viewed scientific inquiry as a mechanical process with little emphasis on the reasoning that typifies scientific inquiry. Students’ participation in their experiments also centered on the procedural aspects of inquiry with little attention to scientific reasoning. There was no explicit attention to the nature of science during the experiments, but the practice implied correct, incorrect, and underdeveloped conceptions of the nature of science. Evidence from the study suggests a need for collaboration between agriscience and science teacher educators to design and conduct professional development focused on scientific inquiry and nature of science for preservice and practicing teachers.

Keywords: scientific inquiry, scientific methods, nature of science

Introduction/Theoretical Framework

Educators have long been engaged in conversations about the connections between agriculture and science. The National Research Council (1988) emphasized these connections by recommending that “ongoing efforts should be expanded to upgrade the scientific and technical content of vocational agriculture courses” (p. 35). This interdependence of agriculture and science is further evidenced in Buriak’s (1992) definition of agriscience: “Instruction in agriculture emphasizing the principles, concepts, and laws of science and their mathematical relationships supporting, describing, and explaining agriculture” (p. 4). Interest in the integration of agriculture and science is reflected in contemporary formal agriscience classroom curricula (e.g., Agriscience Exploration, 3rd edition, 2004) as well as extra-curricular agricultural learning programs (e.g., the National FFA Organization annual Agriscience Fair). In addition to understanding and applying science concepts, formal and informal agriscience education emphasizes learning about the processes and nature of science. These ideas are similarly emphasized in national science education policy documents (e.g., American Association for the Advancement of Science, AAAS, 1993; National Research Council, NRC, 1996). As a result, agriculture and science educators have become partners in their commitment to educating scientifically literate citizens who have a basic understanding of the principles of science and how to think scientifically in their everyday lives.
All students, including those in agriculture classes, have preconceived notions about science and how scientists conduct their work (NRC, 2005). Students’ epistemologies of science, or assumptions of what science is and how scientific knowledge is generated and modified, can be shaped by their experiences in science and agriculture courses. Classroom and laboratory experiences can contribute unintentionally to student epistemologies that are antithetical to that of genuine science by separating science from authentic contexts; focusing on physical methods of completing a lab lesson; and failing to engage students in reasoning about the design, conduct, and outcomes of laboratory activities (Carey & Smith, 1993; Chinn & Malhotra, 2002; Desautels & Larochelle, 1998; Driver, Newton, & Osborne, 2000; Jimenez–Aleixandre, Bugallo Rodríguez, & Duschl, 2000; Moss, Abrams, & Kull, 1998; Osborne, 2002; Smith, Maclin, Houghton, & Hennessey, 2000; Watson, Swain, & McRobbie, 2004). Recent agriculture education research has expanded to include investigating the integration of scientific reasoning and skills into agriculture laboratory experiences (Johnson, 1996; Myers & Dyer, 2006; Myers, Washburn, & Dyer, 2004; Osborne, 2000; Parr & Edwards, 2004). Yet, the agriculture classroom has remained largely unexamined as a venue for learning about how the processes and nature of science are represented during inquiry.

Scientific Inquiry and Nature of Science

The Benchmarks for Scientific Literacy (AAAS, 1993) emphasizes student engagement in scientific inquiry to help meet the goals of educating scientifically literate citizens who have a basic understanding of the principles of science and how to use scientific thinking in their everyday lives. The National Research Council (1996) further underscored the importance of scientific inquiry (SI) and described it as “the diverse ways in which scientists study the natural world and propose explanations based on evidence derived from their work” (p. 23). The NRC explains SI with the following description:

Inquiry is a multifaceted activity that involves making observations; posing questions; examining books and other sources of information to see what is already known; planning investigations; reviewing what is already known in light of experimental evidence; using tools to gather, analyze, and interpret data; proposing answers, explanations, and predictions; and communicating the results. Inquiry requires identification of assumptions, use of critical and logical thinking, and consideration of alternative explanations. (p. 23)

Frequently, SI is incorrectly referred to as the scientific method by teachers and students; however, there is not one, recipe–like method that scientists follow to investigate the natural world (Bauer, 1994).

Distinctly unique, but inextricable from SI, the nature of science (NOS) has been of significant import during the last several decades (Lederman, 2007). Often mistaken as being the same as SI, the NOS refers to “the epistemology and sociology of science, science as a way of knowing, or the values and beliefs inherent to scientific knowledge and its development” (Lederman, Abd–El–Khalick, Bell, & Schwartz, 2002, p. 498). The tenets of NOS that are of interest for this study and are generally accepted as relevant to K–12 science education include: (a) Scientific knowledge can be generated through empirical practices. Scientists use their senses and instruments to observe the natural world, and these observations are influenced by instruments, as well as assumptions made about the instruments; (b) Scientific knowledge is theory–laden and subjective because scientists’ decisions about their research are influenced by professional and personal prior knowledge, experiences, background, and expectations; and (c) Scientific knowledge is socially and culturally embedded because there are established norms for scientific work. Additional norms result from political, economic, philosophical, social, and religious influences from the society within which science operates (Lederman et al., 2002).

Purpose and Objectives

Here we present the findings of an exploratory case study that examines the practice of SI in an agriscience classroom, including how the process and NOS are
represented, by addressing the following research questions: (1) What is the agriscience teacher’s understanding of SI? (2) How do the students participate in SI? (3) How is the NOS represented during the inquiries?

Methods and Procedures

The purpose of this qualitative case study was to investigate in-depth how SI and NOS were shaped in an agriscience classroom, and thus present a comprehensive picture to interested agriculture educators to inform their own teaching and research (Merriam, 1998).

Experiments supported by the Partnership for Research and Education in Plants (PREP) provided a context for the study of agriculture students' engagement in SI. PREP involves students in a study of Arabidopsis thaliana plants from which scientists have disabled genes of unknown functions (Dolan, Lally, Brooks, & Tax, 2008; Lally, Brooks, Tax, & Dolan, 2007). With mentorship from their teachers and scientists, students design and conduct original experiments in their classrooms to gain insight into the disabled gene’s role in the plant’s response to a variety of environmental conditions. In the classroom under study, the plant experiments began with a kick-off session led by a PREP staff member who discussed the benefits of plant research, the role genes play in determining characteristics of plants, and how scientists experimentally determine a gene’s function. Plant scientists and online materials about the plant experiments were available to the teacher and students if they had questions or sought additional information.

Sara and her agriscience class were identified for the study through purposeful sampling (Patton, 1990). Sara was completing her first year teaching and had implemented PREP during the previous semester. Sara’s formal education included a bachelor’s degree in Animal Science and a master’s degree in Agriculture Education. Her school was located in a rural community in a Mid-mid-Atlantic state. Fifteen students in grades 8–10 were enrolled in her class, including three Caucasian females, one African American male, and 11 Caucasian males. Some students in the class intended to join the workforce upon high school graduation while others planned to attend college. Several students in the class received special education services. The PREP experiments closely aligned with the agriscience course curriculum and state competencies, complimenting Sara’s unit on plants.

Data sources included classroom observations, in–class conversations with students, face–to–face interviews with Sara, and students’ work (Denzin & Lincoln, 1994; Merriam, 1998). Sara was interviewed six times using a semi–structured format. The purpose of the interviews was to learn more about Sara’s background, her students, her understanding of scientific inquiry and the nature of science, and the school environment, and to gain insight into classroom goings–on on days the class was not observed.

In her role of participant–observer, the first author observed ten class sessions and recorded field notes on her observations of the general practice of SI, class discussions during the investigations and unrelated lessons, and the actions and interactions of the teacher and students (Gold, 1958; Merriam, 1998). After several class observations, the first author conversed informally with students while they worked on their experiments. During these conversations, she asked students questions such as: “How did you decide on an experimental treatment?” and “How did you decide what features of the plant to observe and measure?” Finally, documents collected for analysis included students’ plans for the experiments, their data tables, and the lab reports.

For the data analysis, code categories were pre–established and based on research questions and literature concerning SI and the NOS. Field notes and student work were analyzed to identify implied or explicit references to the following tenets of the NOS: (a) Scientific knowledge can be generated through empirical practices, (b) Scientific knowledge is socially and culturally embedded, and (c) Scientific knowledge is theory–laden and subjective (Lederman et al., 2002). These features of NOS were chosen because they are most compatible with the context of PREP (i.e., cause–and–effect, quantitative experiment format, and potential for agricultural applications) and cognitively appropriate at the high school level. To identify Sara’s understandings of SI, interviews, classroom observations/field notes, and student work during their experiments were analyzed. Sara’s understanding of SI and the classroom
practice was coded according to the features of SI:

making observations; posing questions; examining books and other sources of information to see what is already known; planning investigations; reviewing what is known in light of experimental evidence; using tools to gather, analyze, and interpret data, proposing answers, explanations and predictions; and communicating the results…. identification of assumptions, use of critical and logical thinking, and consideration of alternative explanations. (NRC, 1996, p. 23)

LeCompte (1987) located sources of subjectivity and bias in professional training and personal experiences and urged researchers to reflect on and identify their own individual sources to improve their research. The primary researcher’s extensive experiences engaging her own secondary science students in SI, as well as her prior experiences researching SI in high school science and agriculture classrooms, invariably influenced this study. The primary researcher identified other key factors that could have impacted the study: the lenses, influenced by her class, race, age, and gender, through which she interpreted the interviews and activities in the classroom; prior work with PREP; and the researcher’s presence in the classroom during the experiments. In light of the bias ever present in educational research, the following strategies were employed to strengthen the trustworthiness of the findings: The first author (a) was in the classroom as often as was possible, and particularly when the students completed their experimental work, (b) collaborated with experienced qualitative researchers and involved them in reviewing the methods and analysis, (c) collected evidence from different data sources, (d) kept good records of process and decisions, and (e) reflected on her own biases or limitations that may have influenced the study (Ary, Jacobs, & Razavieh, 2002; Denzin, 1994; Denzin & Lincoln, 1994; Guba & Lincoln, 1994; Merriam, 1998).

Results and Findings

Question 1: Teacher’s Understanding of Scientific Inquiry

The first research question focused on the teacher’s understanding of SI because this understanding will likely influence the practice of inquiry in the classroom (Crawford, 2007). In general, Sara demonstrated the view of SI as a mechanical process. For example, Sara explained during the first interview: “The research process…the different variables, and keeping recording data, and then making a chart of something out of it and then having a conclusion; ‘This is how a affected b.’” When asked to elaborate about the meaning of inquiry, she added that students are “just, just trying to find an answer to a question.” Sara’s description of the research process and inquiry encompassed several key mechanical features of inquiry (e.g., recording data, writing a conclusion, making a data chart). She did not, however, mention any of the complex cognitive processes of SI, including posing questions, designing experiments, interpreting data, presenting explanations and predictions, or communicating findings. Her classroom actions were consistent with her focus on the mechanics of SI. Her directions and discussions centered on the routine rather than the reasoning involved in experimentation.

Question 2: Students’ Participation in Scientific Inquiry

The second research question focused on the actual practice of SI during the students’ experiments in the agriscience classroom. The students’ participation in their experiments primarily consisted of treating their plants with various metal solutions, watering the plants, making measurements (e.g., plant height), and recording data. Students did not turn to other sources of information to gather basic information about the plants, what metal solutions to use on the plants, or how the metal solutions could impact plant growth and health. While the students did choose which treatment solution to use and which plant feature to observe from short lists provided by Sara, the planning for the experiments had been done in advance by Sara. Students engaged in a few, very brief teacher-lead discussions about their experiments primarily addressing logistics or
methods (e.g., how to water and treat the plants, label equipment, conduct measurements, and fill in the data tables). In addition, even though students worked in teams to conduct their experiments, they typically did not discuss their experiments with their teammates or other students in the class. Because student talking was discouraged, students did not have opportunities to explain or defend their actions or thinking as they conducted their experiments. On the final day of the experiments, Sara quickly summarized the purpose of the experiments and the meaning of the students’ observations. Sara dictated a fill-in-the blank, pre-formatted paragraph for the final project report in which the students inserted information relevant to their own experiments. There were no class discussions about experimental evidence or explanations and conclusions based on the evidence.

**Question 3: The Representations of the Nature of Science during the Scientific Inquiry**

The final research question sought to understand how the NOS was reflected in the students’ plant experiments. There was no evidence from the interviews or observations that explicit attention was drawn to NOS during the experiments (Schwartz, Lederman, & Crawford, 2004). Implicitly, the students’ inquiries reinforced a combination of accepted, underdeveloped, and incorrect conceptions of NOS.

**Tenet 1: Scientific knowledge can be generated through empirical practices.**

Because of the purpose of the PREP experiments, students’ work aligned with the assumption that scientists engage in empirical practices that may lead to the generation of scientific knowledge. In addition, students made direct observations of the plant features and these observations were enhanced by the use of simple equipment such as rulers and magnifying glasses. However, the students’ experiments also reinforced contradictions to scientists’ empirical practices. For example, implied by the students’ inquiries was that scientists’ observations are nonproblematic with regard to equipment use and that scientists do not make inferences about what they cannot observe. The intentional cause–and–effect, controlled quantitative design of PREP experiments and the linear format of the students’ final reports supported the notion that there is a single, lock–step procedure by which scientists conduct their work.

**Tenet 2: Scientific work is socially and culturally embedded.**

Students working in teams reflected the normative practice of scientists collaborating with each other rather than working isolated in laboratories. However, student talking was discouraged, thus limiting the discourse associated with SI. Students did not base their experiments on previous efforts of scientists or students or use conventional formats for sharing their findings and conclusions. Students recorded their data in a traditionally structured data table provided by Sara, but they did not analyze their data or represent it in ways that indicate the meaning of their results (e.g., graphs or diagrams). Connections between the practice of science and the political, economical, philosophical, social, and religious influences from the society within which science operates were limited to the visiting PREP scientist’s brief discussion of the medical benefits of plant research. Implied in the students’ practice of SI was that science and the culture within which scientists work are disconnected.

**Tenet 3: Scientific knowledge is theory–laden and subjective.**

During the experiments, students’ decisions about which treatment to use and which features of the plants to observe were made superficially rather than being based on students’ prior experiences, knowledge, training, values, and beliefs. For example, when students were asked how they decided which treatment solution to use on their plants, the students responded: “I picked it from the list” and “We just picked it.” Implied in their practice was that scientists’ decision–making is based on a choice with no necessary influence from previous experience, knowledge, or training. Students did not address the inherent subjective NOS. Instead, Sara stressed that students needed to be objective: “You are going to observe two things...These can be number of leaves or height of plants. We want to do objective observations, not subjective.” There was no follow–up discussion about the fundamental subjectivity of scientists’ research and the ways in which students may have introduced bias into their work.
Conclusions

The analysis of the student engagement in the experiments indicates that the students attended to the procedural steps of inquiry and were minimally engaged in scientific tasks that involved reasoning or discourse characteristic of SI. In addition, the inquiries lacked attention to assumptions aligning with current conceptions of NOS. These findings agree with previous research conducted in science classrooms indicating that students may attend to the mechanical and practical aspects of laboratory experiences, focus on the completion of their experiments, or discuss procedures and facts instead of engaging in the complex reasoning and the substantive discourse that define SI (Carey & Smith, 1993; Chinn & Malhotra, 2002; Dolan & Grady, 2009; Driver, Newton, & Osborne, 2000; Hofstein & Lunetta, 2004; Jimenez–Aleixandre et al., 2000; Moss et al., 1998; Osborne, 2002; Watson et al., 2004).

Several factors likely influenced the representation of SI and NOS in this classroom. Sara’s prior preservice and inservice teacher education experiences related to SI and NOS fell short of providing her with opportunities to build a thorough understanding of and experience with the nature and processes of science, and the relevant science and pedagogy content knowledge needed to support student learning about NOS and participating in SI. Sara reported that her agriscience class was treated as a “back–up plan” for students who were not planning to go to college and that many of her students had behavior problems, learning disabilities, or attention–deficit/hyperactivity disorder. During the study, Sara was concluding her first year teaching, and she reported that she was still learning about how to manage these students effectively. Struggling with classroom management, an issue cited by other beginning agriculture educators (Myers, Dyer, & Washburn, 2005), likely contributed to Sara’s reluctance to relinquish the responsibility and control necessary to make the transition from a traditionally structured, ordered, and controlled classroom to more free–form, small group experiences that depend upon extensive student and student–teacher discussions as does SI. Her beliefs about her students, teaching, and learning, as well as her reconciliation of these beliefs with school culture, may have influenced the practice of inquiry in her classroom (Crawford, 1999; Llewellyn, 2005; Roehrig & Luft, 2004). In addition, her students were likely unfamiliar and even uncomfortable with the atypical roles students are required to assume in SI (e.g., collaborators, leaders, apprentices, planners). Instead, they held on to the established expectations of the teacher and student roles and discourse structures (Crawford, 2000; Yerrick, 2000).

Chinn and Malhotra (2002) proposed that participating in simple inquiry activities in science classrooms, may actually contribute to students developing a nonscientific epistemology as opposed to an epistemology of authentic SI. Because the practice of inquiry in this agriscience classroom emphasized the mechanical processes of inquiry, the tenets of the NOS, as well as opportunities for reasoning and discourse, were minimized. It is likely that the students’ inquiry experience contributed little, if any, to the development of students’ informed conceptual understanding of the NOS and scientific processes.

Recommendations

The authors believe that conducting the plant experiments in this agriscience classroom could have nurtured students’ epistemologies of science and more closely reflected the authentic practice of scientists had Sara been supported with professional development related to SI and NOS. Because of the current professional interest in engaging agriscience students in classroom experiments and FFA projects, the authors urge agriculture and science teacher educators to design and implement preservice and inservice professional development collaboratively to help teachers prepare for and conduct SI in their classrooms. Specifically, these experiences should engage teachers in their own authentic inquiries, preferably grounded in the context they will use in their classes, that promote learning about the NOS and scientific reasoning strategies, as well as how to promote NOS in the classroom. Such opportunities would support teachers with learning and practicing new roles as guide, motivator, learner, modeler, and co–researcher and new instructional strategies such as modeling, coaching, and scaffolding, as well as providing other instructional support for

Teacher education programs in science and agriculture can support teachers by providing materials and guides and ongoing mentoring support and opportunities to interact with other teachers while they implement the inquiries in their classrooms (Akerson & Abd–El–Khalick, 2003; Edelson, 1998). Also, teachers must be supported as they attempt to move the thinking and practice in their classrooms beyond the traditionally accepted classroom practices and discourse for students of lower abilities and motivation or in lower track classrooms (Roehrig & Luft, 2004; Kang & Wallace, 2004; Yerrick, 2000). Finally, to be better prepared to provide effective SI and NOS instruction and support for their preservice and inservice teachers, it may be necessary for teacher educators to participate in SI and NOS professional development.

In light of these case study findings, the authors recommend that science and agriculture educators continue with their commitment to research the integration of science and agriculture. In particular, the authors suggest that research be expanded to examine (a) the practice of SI facilitated by veteran teachers who have participated in SI and NOS professional development, (b) the practice of SI in additional agriscience classrooms and how this agriculture context and inquiry practice contribute to students’ developing views of NOS, (c) the factors that promote and inhibit SI in agriscience classrooms, and (d) how university science and agriculture teacher educators can collaborate to prepare and support preservice and practicing teachers for successful inquiry experiences in their classrooms that promote students’ developing understanding of the NOS.

Acknowledgments

The authors thank Sara and her students for their participation in the research. The authors also thank the editor and anonymous reviewers for their careful reading and thoughtful feedback. Initial support for PREP was provided by a grant from the National Science Foundation (NSF: DBI–9975808). Continued development of PREP and preparation of this publication was made possible by grant funding from NSF MCB–0418946 and grant number R25 RR08529 from the National Center for Research Resources (NCRR), a component of the National Institutes of Health (NIH). Its contents are solely the responsibility of the authors and do not necessarily represent the official views of NCRR, NIH, or NSF.

References


JULIE R. GRADY is an Assistant Professor of Curriculum in the Department of Educational Leadership, Curriculum, and Special Education at Arkansas State University, P.O. Box 1450, State University, AR 72467, jgrady@astate.edu

ERIN L. DOLAN is an Associate Professor in the Department of Biochemistry at Virginia Polytechnic Institute and State University, Fralin Life Science Institute, West Campus Drive MC 0346, Blacksburg, VA, 24061, edolan@vt.edu.

GEORGE E GLASSON is an Associate Professor in the Department of Teaching and Learning at Virginia Polytechnic Institute and State University, 319 War Memorial Hall, Blacksburg, VA 24061, glassong@vt.edu
Eugene Davenport’s Education for Efficiency

Michael J. Martin, Agricultural Education Instructor
Urbana High School, Urbana, IL

Philosophical research into the Smith–Hughes Vocational Education Act of 1917 has primarily centered on the arguments of Social Efficiency and Democracy and Education. Yet, there was a philosopher that stood for a middle ground of this debate, Eugene Davenport (1856–1941). He fought against legislation that betrayed his Education for Efficiency philosophy. Davenport wrote books and pamphlets about a national system of vocational education. Davenport and his Education for Efficiency philosophy was significant in the legislative battles for vocational education and represented an agricultural voice in the educational debates of the day.

Keywords: historical, philosophy, educational legislation

Introduction

Historical analyzation of the vocational education arguments has been considered a significant component of Career and Technical Education (CTE) research. Research has centered on the collations between various stakeholders concerned with creating a national system of vocational education within America. A research trend has focused on the debates between Democracy and Education and Social Efficiency advocates (Fones–Wolf, 1983; Gordon, 2003; Hillison, 1995; Kliebard, 1987, 1999; Smith, 1999). Camp and Doolittle (1999) and Hylsop–Margison (2001) found that CTE was rooted in the Social Efficiency philosophy. Furthermore, Dewey’s philosophy of Democracy and Education has not been instituted in vocational education (Doolittle & Camp, 1999). While Social Efficiency and Democracy and Education advocates influenced vocational education, an alternative philosophy existed in that era that closely represented the eventual Smith–Hughes Act of 1917. Eugene Davenport’s philosophy was widely disseminated and cited as being influential (Stimson & Lathrop, 1942) but has been neglected in historical examinations of vocational education paradigms. Davenport and his Education for Efficiency philosophy was credited with helping build a collation for vocational education before the Smith–Hughes Act of 1917.

The movement for vocational education in the late 19th and early 20th centuries has been associated with the philosophy of Social Efficiency. Proponents of Social Efficiency included Snedden and Prosser, both working under the post of Commissioner of Education for the Massachusetts (Hylsop–Margison, 2001). The tenets of Social Efficiency included socioeconomic stratification, social control, and behaviorism (Doolittle & Camp, 1999). Social Efficiency proponents also argued for a dual system of education that separated vocational and academic students, but the separation could be temporary to ensure the practicality of curriculum for vocational studies (Snedden, 1915). Snedden argued that liberal, or academic studies, and vocational studies were pedagogically opposed to each other (Prosser, 1913, Snedden, 1910, 1912). Advocates of the Social Efficiency espoused that social stratification, the formation of separate table social classes, was an inevitable process of Social Darwinism. Social Efficiency advocates have been associated with the tenets of behaviorism. The pedagogy of behaviorism focused on developing workforce skills in students. According to Doolittle and Camp (1999) behaviorism remains a major facet of Career and Technical Education (CTE) even today. The Social Efficiency model gained widespread support, but also fueled a debate between educationalists of the time.
Opposition to the Social Efficiency philosophy originated from educational experts and philosophers. The most famous of these arguments were from John Dewey. He rallied against an education that would create social stratification and the loss of a universally integrated education. Dewey’s Democracy and Education philosophy argued for an educational system that holistically trained students to be better people and citizens, not more efficient laborers (Doolittle & Camp, 1999; Hyslop-Margison, 2001). Students needed to have an academic education to increase their happiness and civic responsibility while also receiving some vocational education (Dewey, 1917). There would be no separate tracks for students who were academically or vocationally inclined (Kliebard, 1999). Dewey believed that students can learn occupational skills while receiving an education that emphasized their individual capacities.

Persons cannot live without means of subsistence… If an individual is not able to earn his own living… he is a drag or parasite upon the activities of others… There is however, grave danger that in insisting upon this end, existing economic conditions and standards will be accepted as final. A democratic criterion requires us to develop capacity to the point of competency to choose and make its own career. (Dewey, 1966, p. 119)

According to Dewey, the danger of teaching specific vocational skills included the constant evolution of mechanized industry. Students would be learning precise industrial skills that would be irrelevant in a short period time because of new industrial technology. He was also consistently weary of any Federal plan for vocational education because the needs of industry would come before interests of students (Kliebard, 1987). Dewey has been associated with constructivist educational theory, which is the antithesis of behaviorism. “The essential core of constructivism is that learners actively construct their own knowledge and meaning from their experiences” (Doolittle & Camp, 1999, p. 6).

Dewey’s constructivist approach to teaching was criticized by Social Efficiency advocates as being too inefficient (Hyslop-Margison, 2001; Kliebard, 1999). The arguments between Social Efficiency and Democracy and Education spilled over into the public sphere with the publication of the Dewey and Snedden debate (Dewey, 1914, 1915a, 1915b, 1917; Snedden, 1912, 1915), as well as other public commentaries about vocational education (Bishop, 1911; Cromwell, 1915; Hays, 1908; Matscheck, 1916).

Yet, there were other prominent voices in the debate for vocational education that have been all but lost to history. One of those voices was of Eugene Davenport, Dean of the College Agriculture at the University of Illinois. He worked to build a national system of vocational education from 1908–1915 through lobbying legislators, writing books and pamphlets, and lecturing across the United States. Eugene Davenport’s book, Education for Efficiency, represented his philosophy of vocational education. The Education for Efficiency philosophy could constitute the most significant agricultural influence in the debate for vocational education. The purpose of this historical study was to reexamine the debates for a national system of vocational education while including Davenport’s philosophy of Education for Efficiency. There were two research questions that framed the study. First, what was Davenport’s Education for Efficiency philosophy? Second, what impact did Davenport have on the formation of a national system of vocational education?

Methods

Historical research methods were used to accomplish the purposes of this study (Ary, Jacobs, & Razavieh, 1996). Educational researchers utilize documents to interpret the meaning and significance of historical events. The essential task of historical research is to build causal inferences.

Causal inference in historical research is the process of reaching the conclusion that one set of events brought about, directly or indirectly, a subsequent set of events. Historians cannot prove that one past event caused another, but they can make explicit the assumptions that underline their attributions of causality in sequences of historical events. (Gall, Gall, & Borg, 2007, p. 546)
This historical analysis of Davenport’s *Education for Efficiency* philosophy was an examination of vocational education history through a social microscope. The Davenport situation represented a relevant and lesser-known segment of the Smith–Hughes debate between *Social Efficiency* and *Democracy and Education*. The value of the historical examination of *Education for Efficiency* was to illuminate the alternative paradigms in vocational education (Burke, 1993).


Trustworthiness was built by the researcher throughout the research. The researcher exposed all documents to internal and external criticism. The researcher established external criticism by reviewing each document to determine originality and authenticity. None of the documents were found to be forgeries or altered documents. The documents were also examined for internal criticism to evaluate the accuracy and worth of the statements for addressing the objective of the study. An audit trail, a reflexive journal, and peer critiques of themes were also part of the internal criticism process to deter bias (Gall et al., 2007).

**Davenport’s Education for Efficiency**

Amid the debates between the *Social Efficiency* and *Democracy and Education* specialists were the arguments presented by Eugene Davenport. His belief of *Education for Efficiency* became a philosophical statement about vocational education in America. Eugene Davenport was the Dean of the College of Agriculture at the University of Illinois from 1895 to 1922 (Nolan, 1929). There, he had political and public influence in the debate of vocational education. The *Education for Efficiency* philosophy advocated for a universal education that trained all students to their fullest potential in academic and vocational subjects (Davenport, 1909b), which was a middle ground between the two popular vocational education philosophies.

*Education for Efficiency* aligned with those who advocated for *Social Efficiency* by promoting for specialized industrial training for high school students. “… Efficiency in something … that will contribute to the sustenance, the development, or the happiness of man…” (Davenport, 1909a, p. 102). Davenport believed that between 25 to 50 percent of a student’s class time should be in vocational studies. Yet, he was against the *Social Efficiency* tenet of social stratification.

Davenport argued for the *Democracy and Education* belief of social equality through education. “To segregate any class of people from the common mass, and to educate it by itself and solely with reference to its own affairs is to make it narrower and more bigoted generation by generation” (Davenport, 1908b, p. 6). Davenport was also motivated to advocate for universal education because of the need for social and occupational mobility. “To educate the children of different classes separately is to prevent the natural flow of individuals from one profession into another…” (Davenport, 1908b, p. 7).

Finally, he agreed on the principles of behaviorism (*Social Efficiency*) but maintained that constructivism (*Democracy and Education*) had a place even in vocational education. “We must find ways of teaching the vocations which will not only train for service, but also educate the individual as much as possible and develop the occupation…” (Davenport, 1915a, p. 18). Many of Davenport’s philosophical tenets represented either side of the *Social Efficiency* and *Democracy and Education* debate.

Ultimately, Davenport aligned himself with the ideals of both *Social Efficiency* and *Democracy and Education* by arguing for public high schools that included both vocational and academic classes for both vocational and liberal purposes. “Whether the education be classical or industrial, it is alike a part and an essential part
of the successful development of young, strong, and virile race” (Davenport, 1908a, p. 7). His belief in the value of vocational education co–existing with academic education helped to build his arguments against separate vocational school systems. The greatest success of vocational education would come from the association with the non–vocational subjects (Davenport, 1915a). Children should be educated holistically for a life beyond their occupations. “The ultimate object of all education is not industrial efficiency but the full development of man; for vocation is a means of living and not the purpose of existence” (Davenport, p. 21). The union of the two polarized philosophies was a critical precept of Education for Efficiency.

Davenport became involved in the political debates of vocational education as early as 1908 with the Davis Bill. The Davis Bill was designed to create a separate system of schools for vocational education funded by the Federal Government (Kliebard, 1999). The Bill had numerous influential supporters including Snedden. Yet, the Davis Bill drew many critics who were against two separate educational systems, such as Davenport. Davenport claimed his influence against the Davis Bill involved the Assistant Secretary of Agriculture, Dr. W. M. Hays. Hays was a prominent figure in vocational education bills, including the Nelson Amendment (True, 1929). He worked to recreate the separate vocational school system that existed in Minnesota and Wisconsin through the Davis Bill. Davenport reported his influence with Dr. Hays within his unpublished autobiography (1936).

So I said to my friend Hays that if he did not desist from all attempts to get this favorite legislation through Congress I would campaign the country and organize an opposition that would bury his pet schemes too deep to be resurrected. The bluff worked…” (p. 48)

The Davis Bill died in the 60th Congress in 1910 (True, 1929). Agricultural education historian Rufus Stimson credited Davenport’s message of a unified education system as being more effective in gaining public support than the arguments of a dual system of public education (Stimson & Lathrop, 1942). Davenport called the defeat of the Davis Bill and the separate school system the greatest victory of his life (1936).

Davenport worked to make what he had proposed in his Education for Efficiency a reality, even after the defeat of the Davis Bill. He made reports to the Association of Agricultural Colleges and Experiment Stations (True, 1929), National Education Association (1909b), Pan American Scientific Congress (1915b), Prairie Farmer magazine (1911a), Ladies Home Journal (1912), various state teachers’ associations (1909c, 1910a, 1910b, 1911b), and the Commission on National Aid to Vocational Education (1914) advocating for his vocational education system. Davenport contribution to the evolution of vocational education was to enlighten teachers, professionals, and the general public about his beliefs of Education for Efficiency and lobbying for a national system of unified education.

The Smith–Hughes Vocational Education Act of 1917 validated many of the arguments of Education for Efficiency. The Smith–Hughes Act created separate tracks of vocational education within the existing public secondary school system. The subjects that fell under the umbrella of vocational education included agriculture, industrial education, and home economics. Funding from the Federal government would be administered through state boards of vocational education. The funds would be awarded to those high school vocational courses that were preparing students for work in those indicated vocational fields. At least half of the instruction for those students in vocational tracks must be directed “to practical work on a useful or productive basis…” (Kliebard, 1999). Education for Efficiency aligned with many parts of the Smith–Hughes Act. The paralleling of vocational and academic tracks within the same school aligned with the Education for Efficiency demand for universal education. Davenport agreed with the distinction between academic and vocational courses as well. “Every man needs two educations, one that is vocational and one that is not – one that will fit him to work and one that will fit him to life” (Davenport, 1909a, p. 61). Finally, the Smith–Hughes Act also advocated for instruction in at least 50 percent of vocational courses for students in a vocational track, though Davenport argued for between 25 and −50 percent (Davenport). Davenport was excited about the Smith–Hughes
Act and called it a personal triumph (1936). Davenport stopped campaigning for his *Education for Efficiency* philosophy after the passing of the legislation through Congress.

**Summary**

*Education for Efficiency* represented a middle ground between the larger debates of *Social Efficiency* and *Democracy and Education* and aligned to the main tenets of the Smith–Hughes Act of 1917. Davenport’s efforts in disseminating his *Education for Efficiency* philosophy to educational stakeholders helped solidify the support for vocational education in public schools. He was directly cited in the defeat of Davis Bill of 1907 (Stimson & Lathrop, 1942), and his lobbying efforts for vocational education form a causal inference to the precepts of the Smith–Hughes Act. The following table aligns the tenets Davenport’s *Education for Efficiency*, which were represented in the Smith–Hughes Act, with the contemporary philosophies of *Democracy and Education* and *Social Efficiency*.

<table>
<thead>
<tr>
<th>Tenets of <em>Education for Efficiency</em></th>
<th>Educational Philosophies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Traditional academic education for all secondary students</td>
<td><em>Democracy and Education</em></td>
</tr>
<tr>
<td>Social equality and opportunity through education</td>
<td><em>Democracy and Education</em></td>
</tr>
<tr>
<td>Distinct vocational courses in secondary schools</td>
<td><em>Social Efficiency</em></td>
</tr>
<tr>
<td>Intensive training in vocational topics</td>
<td><em>Social Efficiency</em></td>
</tr>
</tbody>
</table>

Davenport favored the *Democracy and Education* ideals of academic and social equality through education. Dewey and Davenport worked against a vocational education system that would lead to the social stratification of the American working class. Yet, Davenport still held some of ideals of the *Social Efficiency* movement in high regard. He argued for vocational training in public high schools with no less than 25 percent of the student’s curriculum in vocational topics. The assertion of intensive and purposeful education in vocations was in alignment with *Social Efficiency* precepts as well. Finally, Davenport united the two arguments by calling for both traditional courses and intensive vocational education courses within the same school. Furthermore, he argued that these subjects should be taught in both constructivist and behaviorist teaching methods. The passage of the Smith–Hughes Act resulted in mixed reactions with educational leaders.

Researchers have cited Dewey’s unhappiness and the victory of *Social Efficiency* advocates with the Smith–Hughes Act (Doolittle & Camp, 1999; Hyslop–Margison, 2001; Kliebard, 1999). Dewey believed that the difference between vocational education tracks in a unified school and a separate vocational school system was minimal (Gregson, 1995; Kliebard, 1987). But the Smith–Hughes Act was a compromise to the early vocational educational bills, such as the Davis Bill of 1907. The Smith–Hughes Act allowed for students to be educated in the academic and vocational subjects in the same school, even though separate vocational education tracks were established (Bragg & Reger, 2000; Braundy, 2004; Lewis, 1998; Rury, 1984). Prosser continued to lobby for a separate school system until 1917 when he had to concede (Wirth, 1972). Davenport (1936) felt personally satisfied with the Smith–Hughes Act of 1917. While *Education for Efficiency* represented portions of the Smith–Hughes Act of 1917, no direct link between the two could be found. Davenport virtually stopped his vocational educational writing efforts after 1917. This may be the main reason why Davenport has been an ignored figure in the history of Career and Technical Education. Yet, Davenport’s philosophy should not be ignored by agricultural education historians because he was an influential figure in the national debate of vocational education.
References


Davenport, E. (1908b). The next step in agricultural education or the place of agriculture in our American system of education. Urbana, IL: University of Illinois.


Davenport, E. (1911a). Agricultural problems to be solved by the next generation. Prairie Farmer, 83(22), 8.

Davenport E. (1911b, October). The vocation and the man. Paper presented at the Minnesota Teachers’ Association, Minneapolis, MN.


Davenport, E. (1936). What one life has seen: Personal recollections of an epochal era. Unpublished manuscript, College of Agriculture, Consumer, and Environmental Science, University of Illinois, Urbana, IL.


MICHAEL J. MARTIN is an Agricultural Education Ph.D. Student at the University of Missouri, 124 Gentry Hall, Columbia MO 65211, mjmgg7@mail.missouri.edu
Likelihood of Students in the Formal Education System in Trinidad to Pursue Agriculture as a Profession and the Implications for Development

Marcus N. A. Ramdwar, Instructor II  
University of Trinidad and Tobago  
Wayne G. Ganpat, Lecturer  
University of the West Indies, Trinidad and Tobago

As part of Caribbean–wide initiatives to modernize agriculture, the formal education system for agriculture in Trinidad is coming under scrutiny. This paper investigates the perceptions students have about agriculture, the likelihood of those in the secondary school system (n=300) to pursue a formal education in agriculture, and the likelihood of those in the tertiary system (n=100) to continue in a career in agriculture. Likert–type scales were used to assess perceptions, and the likelihood of students in the formal education system in Trinidad to pursue agriculture as a profession was measured on a rating scale. Relationships were examined between school location (North, South, and Central), students’ residential area (Rural, Urban), gender, and the likelihood to pursue a career in agriculture. Data were presented as descriptives and correlations. Results show that in schools where agriculture is not taught, while students firmly believed that agriculture is very important, very few would make it a career–choice. In secondary schools where agriculture is taught, students were generally favorable in their overall attitudes to agriculture, but there was only moderate indication that they would pursue the field further as a career. There were significant relationships between gender, school’s location, and students’ residential area and the likelihood to pursue agriculture. At the tertiary level, there was very strong indication that these students would continue in a career in agriculture. However, they were most likely to seek higher education and research in the field or seek out salaried positions in the public service. Female students were more likely to continue a career in agriculture than males. Recommendations included policy actions to introduce agriculture as a science to all students in the formal education system, a re–engineered curriculum based on modern technology use and specially developed career days, exhibitions and field visits to attract young people to the discipline.

Keywords: agriculture, students, formal education, career

The development of a well-trained workforce is critically important to the competitive success and the profitability of Trinidad agriculture. Building capacity through formal agricultural education is needed for the production of skilled manpower to serve the agricultural sector in several areas (Lindley, Van Crowder, & Doron, 1996). While the focus traditionally has been on providing high levels of skill in production practices, increasingly, due to global demands, post production, value addition, and entrepreneurship have come to the fore because of the re–emergence of food security as a global imperative (Mochoge & Zziwa, 2007). For countries that depend on agriculture to feed its people and earn foreign exchange, it is critically important that students are exposed to agriculture as a science at the earliest time in their school career and intentional actions taken to promote entry into the profession.

Formal exposure to agricultural education in Trinidad and Tobago occurs at three levels: primary school, age range (5 – 11); secondary school level, age range (12 – 16); and tertiary level education ages 16 and over. Most primary school students are introduced to agriculture in the form of “gardening,” both for exposure to
the subject and for recreational purposes. Secondary schools are classified into so-called “prestigious schools,” which are state-assisted but managed by boards associated with various religious denominations, and perceived to be much better than the so-called “non-prestigious schools,” which are solely state-funded and managed. Students gain entry into “prestigious schools” based on high or above average performance at the island’s secondary entrance examination. Students of average and below performance gain entry into schools which are considered to be “non-prestigious.” Agriculture as an examinable subject is offered only at the fully state-funded schools. One obvious consequence of the classification of secondary schools in Trinidad and Tobago into “prestigious” and “non-prestigious” is the perception that agricultural education is for those students who are less academically inclined. The University of the West Indies (UWI) and the Eastern Caribbean Institute of Agriculture and Forestry (ECIAF) provide formal agricultural training towards the degree and diploma qualifications respectively. The degree allows for professional advancement whereas the diploma caters for para-professionals within the field of agriculture.

Hoover and Scanlon (1991) reported that the image of the agriculture profession and perceived future value of agricultural education were obstacles to student enrollment in the study area. Thompson and Russell (1993) reported that talented young students are being counseled or attracted into engineering, business, and medicine in pursuit of economic security and status. Onuekwusi and Ijeoma (2008) also agreed that students did not perceive agriculture as a discipline with a professional status. Goecker, Whatley & Gilmore (1999) suggested that “much greater efforts will be required to attract sufficient numbers of outstanding students to prepare for very challenging careers in the world’s food, agricultural, and natural resources system.” Talbert, Larke, Jones, & Moore (1997) noted that the majority of the undergraduate students enrolling in colleges of agriculture represent non-urban areas and suggested that college recruitment efforts should focus on students from urban areas. Jamali (2009) indicated that there was a need to change the mindset of people, who tend to be overly influenced by tradition and social/cultural norms.

From a global perspective, the Food and Agriculture Organization (FAO) (1997) pointed to the failure of agricultural education and training in many developing countries to adapt to a changing world.

Agricultural development in the Caribbean region is changing, and a new agricultural development model is currently being promoted. According to Chakeredza et al. (2008, p. 326) it is the development of the human resource which will “get agriculture moving.” This alternative approach will require a new cadre of agricultural scientists. More astute professionals and paraprofessionals will be needed to sustain the approach, and it is imperative that action be taken in Trinidad to address the profession’s growing demands.

**Purpose of the study**

It is the belief that recruitment efforts into formal agricultural programs in Trinidad should attempt to attract students who are more intellectually inclined and not left to chance for entry by students not doing well academically. The purpose of the paper is to determine the type of students who study agriculture, their perceptions of the profession, and, more importantly, the likelihood that they will make a career in agriculture. The results are expected to highlight areas for intervention by policy makers coming jointly from the areas of agriculture and education to meet the national requirements for agricultural workers and professionals. The following objectives were identified:

1. To determine secondary school students’ perception of agriculture’s importance to the country and possible career choice,
2. To determine agricultural science students’ perception of agriculture and likelihood to pursue agriculture as a career, and
3. To determine what factors influenced tertiary level agriculture students to choose agriculture as a study area and likelihood to stay in the profession.
Methodology

The study was done in three phases. In the first phase, a limited survey was done in 2007 to determine students’ perception of the importance of agriculture to Trinidad and to what extent they would consider a career in agriculture. A sample of 200 secondary schools students (age 14 – 16 years) from both religion–based schools, which, over time, have come to be considered as “privileged” or “prestigious,” and government–based schools, which are considered as “non–prestigious,” were surveyed. The sample represents about five percent of the population in the 14–16 age group category.

Based on the findings in the first phase, a second phase in 2008 focused on students in the so called “non–prestigious”, government–run schools where agricultural science is taught as an examinable subject. Five schools each in the North, Central, and Southern regions in Trinidad were randomly selected from all schools teaching agricultural science, then 20 students were randomly selected from each school from the class register and surveyed, making a sample size of 300. This represented about 10% of the population of agricultural science students. The self–reporting survey questionnaire sought to explore students’ attitude towards agriculture, and the likelihood that they would pursue a career in agriculture. Beyond personal and demographic data, a 10–item Likert–type scale was used to assess their attitudes. Students were asked to respond to both positively and negatively worded statements to indicate whether they strongly agreed (SA), agreed (A) disagreed (D), or strongly disagreed (SD) with the sentiment expressed. Responses were scored (SA = 4; A = 3; D = 2; SD = 1) for positively worded statements, and scores were reversed for negatively worded statements. Mean scores for each item statement as well as overall mean scores were calculated, reported, and used to describe main influences on students’ decisions. Likelihood to pursue agriculture as a career (secondary level) and likelihood to remain in agriculture (tertiary level) were both measured by single item scales.

Instruments were reviewed for content validity by extension colleagues and pretested before being completed. All data were coded and analysed using the Statistical Package for Social Sciences (SPSS) software. Most data results are presented as descriptives. Relationships are also examined using both Spearman’s Rho and the Kruskal–Wallis test depending on the type of data and assumptions being made about normality.

Results

The results are provided in three sections according to the phase of the study.

A. Secondary schools students’ perception of agriculture’s importance and career choice

Students’ responses for both “prestigious” and “non–prestigious” schools for the importance of agriculture to Trinidad and agriculture as a career option were compared. The results revealed that there was no significant difference with respect to the students’ perception of the importance of agriculture. Both categories of students overwhelmingly agreed (with equal percentages; 96% yes and 4% no) that agriculture was important to Trinidad. However, there is a significant difference (p < 0.0001, based on Fisher’s exact test) between their opinions about choosing agriculture as a career option. “Non–prestigious” school students...
were more likely to choose agriculture as a career option (76% Yes) in contrast to “prestigious” secondary school students (4% Yes).

B. Agricultural students’ attitudes to agriculture and likelihood to pursue as a career

This phase of the study was conducted among the so-called “non-prestigious” secondary schools which teach agricultural science as an examinable subject. The sample population (n = 300) comprised of three sub-samples of 100 students from each of the Northern, Central, and Southern regions of Trinidad. For purposes of the study, all Northern schools will be considered as urban-based, and both Central and Southern countries as rural-based. This reflects to a large extent the demographic distribution of the population. The sample consisted of males (n = 145) and females (n = 155). There were 115 urban respondents and 185 rural respondents.

Table 1 shows mean response scores of all respondents (n = 300) for the attitudinal items investigated. The table also summarizes relationships between students’ gender, geographic location of school, students’ residence and the attitudinal items under investigation, and the likelihood of pursuing a career in agriculture. Generally students’ overall attitude was positive. An examination of the item statements show the highest mean scores were obtained for the attitudinal items that dealt with the economic importance of farming: “agriculture is an excellent opportunity for self-employment” (M = 3.51) and respondent’s belief that “one can make a good living from farming” (M = 3.36). Their positive attitude was also reflected in their general disagreement with negatively worded sentiments; “agriculture is a dead end job” had a mean response of 3.34, and “agriculture should be for those who do not do well in school” had a mean of 3.28. Again, they were fairly proud “to let other students know that I am doing agricultural science as a subject” (M = 3.11). Students however showed some agreement with negative sentiments such as “people generally look down at farming,” which had the lowest mean score of 2.23, and “farming is too much hard work,” which also had a mean value of 2.61. There were significant weak negative correlations for nearly all the attitudinal items examined and the likelihood that they would pursue a career in agriculture, suggesting that regardless of the fairly good expressions and sentiments they held about agriculture, based on responses to some statements, they were not likely to pursue a career in the field. Thus, the “likelihood to pursue a career in agriculture” mean score (2.57) was just over the midpoint on the four point scale.

The data show that there were significant associations between gender, students’ residence, and school’s location and the likelihood that they will pursue a career in agriculture. Female students were more likely to pursue a career in agriculture than male students, students from urban–based schools were less likely than rural–based schools to pursue agriculture, and schools in the Central and South regions of the country were more likely to pursue agriculture as a career option.
Table 1
Means, Standard Deviations for Item Statements, Relationships Between Selected Parameters, Item Statements and the Likelihood To Pursue a Career In Agriculture, Trinidad and Tobago, 2008

<table>
<thead>
<tr>
<th>Likelihood Response</th>
<th>Mean (M)</th>
<th>SD</th>
<th>Relationship with “likelihood to pursue a career in agriculture”.</th>
</tr>
</thead>
<tbody>
<tr>
<td>What is the likelihood that in the future you will pursue a career in agriculture?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Item statements</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. It is an excellent opportunity for self-employment.</td>
<td>3.51</td>
<td>0.66</td>
<td>-0.19 **</td>
</tr>
<tr>
<td>2. I believe one can make a good living from farming.</td>
<td>3.36</td>
<td>0.67</td>
<td>-0.18 **</td>
</tr>
<tr>
<td>3. Agriculture is a dead end job.</td>
<td>3.34</td>
<td>0.65</td>
<td>-0.10</td>
</tr>
<tr>
<td>4. Agriculture should be for those who do not do well in school.</td>
<td>3.28</td>
<td>0.86</td>
<td>-0.05</td>
</tr>
<tr>
<td>5. I am proud to let other students know that I am doing agricultural science as a</td>
<td>3.11</td>
<td>0.87</td>
<td>-0.35 **</td>
</tr>
<tr>
<td>6. A young person can make a good life through farming.</td>
<td>3.11</td>
<td>0.61</td>
<td>-0.21 **</td>
</tr>
<tr>
<td>7. If more modern technology, including computers were involved in farming, I would</td>
<td>2.98</td>
<td>0.86</td>
<td>0.04</td>
</tr>
<tr>
<td>8. Farming is too much hard work.</td>
<td>2.61</td>
<td>0.88</td>
<td>-0.28 **</td>
</tr>
<tr>
<td>9. People generally look down at farming.</td>
<td>2.23</td>
<td>0.83</td>
<td>-0.06</td>
</tr>
</tbody>
</table>

Other variables

<table>
<thead>
<tr>
<th></th>
<th>X² (df)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender (Male = 1; Female = 2)</td>
<td>5.28 * (1df)</td>
</tr>
<tr>
<td>School Location (North = 1, Central = 2, South = 3)</td>
<td>11.43 ** (2df)</td>
</tr>
<tr>
<td>Residence (Urban = 1; Rural = 2)</td>
<td>117.2 ** (1df)</td>
</tr>
</tbody>
</table>

*; Significant at the 0.05 level (2-tailed); **; Significant at the 0.01 (2-tailed).
“r” is based on Spearman’s rho; X² (df) refers to Chi Square value (degrees of freedom).

C. Diploma- and tertiary-level agriculture students reasons for entry into the profession and likelihood to continue

The sample (n = 100) consisted of male (n = 58) and female (n = 42) respondents, who were mostly from rural areas (n= 78).

Table 2 summarizes in order of importance, based on mean scores, the reasons which influenced students’ decisions to enroll into formal agricultural programs beyond secondary school in Trinidad. The table also summarizes the relationships between gender, tertiary institution, area of residence, and the decisional influences on the likelihood that students “will continue a career in agriculture in the future.”

The highest ranked reason (M = 3.31) was participants wanting “to make a difference to the agriculture sector.” Employment issues whether self-employment and employment in the government services were also high on students minds with mean values of 3.23 and 3.20, respectively. Further study, secondary school exposure to the subject, and to become a well-trained farmer were also highly influential reasons. The lowest mean was (1.59) was for the reason that “no other option of study was available.” Data show that there is a high likelihood (M = 4.62) that these students would remain in agriculture with some 68% expressing that there is a strong likelihood to continue a career in agriculture in the future.

While most of the reasons presented to respondents were significantly associated with their likelihood to continue a career in
agriculture in the future, the strongest significant positive correlations were with respondents’ career desires “to further a professional career at the tertiary level,” followed by the reason “to become a professionally trained farmer.” All other significant correlations were weak. No relationships were found between students wanting “to become a secondary school teacher in agriculture,” to use agriculture studies “as a pathway option for an alternative study,” and to “get employed in the Ministry of Agriculture.” The only negative correlation (−.30) was to the statement “no other option was available to me,” suggesting that any agreement to this statement negatively impacted on the decision to continue a career in agriculture.

With respect to the other variables examined, type of tertiary institution and students’ residential area were not associated with likelihood to continue a career in agriculture. However, gender was significantly associated as female students were more likely to continue a career in agriculture.

Table 2
Ranked Means, Standard Deviations for Influential Reasons and Relationships Between These Influential Reasons, Selected Parameters and Likelihood To Continue A Career In Agriculture, Trinidad and Tobago 2009 (N= 100).

<table>
<thead>
<tr>
<th>Likelihood Response</th>
<th>Means Rank</th>
<th>(SD)</th>
<th>Relationship with “likelihood to continue a career in agriculture”. (r)</th>
</tr>
</thead>
<tbody>
<tr>
<td>What is the likelihood that in the future you will continue a career in agriculture?</td>
<td>4.62</td>
<td>0.59</td>
<td>_</td>
</tr>
<tr>
<td>Suggested reasons</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. I felt as though I could make a difference to the agriculture sector.</td>
<td>3.31</td>
<td>0.84</td>
<td>0.30 **</td>
</tr>
<tr>
<td>2. I saw an opportunity for self-employment.</td>
<td>3.23</td>
<td>0.93</td>
<td>0.32 **</td>
</tr>
<tr>
<td>3. I wanted to get employment in the Ministry of Agriculture.</td>
<td>3.20</td>
<td>1.10</td>
<td>0.19</td>
</tr>
<tr>
<td>4. I wanted to further a professional career at the tertiary level at the Masters or Doctoral levels.</td>
<td>3.19</td>
<td>1.07</td>
<td>0.51**</td>
</tr>
<tr>
<td>5. I was exposed to the subject in school which led to my decision.</td>
<td>3.07</td>
<td>1.08</td>
<td>0.21*</td>
</tr>
<tr>
<td>6. I wanted to become a professionally trained farmer.</td>
<td>3.03</td>
<td>1.13</td>
<td>0.43 **</td>
</tr>
<tr>
<td>7. Parents and/or family were involved in farming.</td>
<td>2.68</td>
<td>1.04</td>
<td>0.21 *</td>
</tr>
<tr>
<td>8. I wanted to become a secondary school teacher in agriculture.</td>
<td>2.47</td>
<td>1.15</td>
<td>0.13</td>
</tr>
<tr>
<td>9. It was a pathway option for an alternative study.</td>
<td>2.18</td>
<td>1.13</td>
<td>– 0.15</td>
</tr>
<tr>
<td>10. No other option was available to me.</td>
<td>1.59</td>
<td>0.92</td>
<td>– 0.30 **</td>
</tr>
<tr>
<td>Other variables</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender (Male = 1; Female = 2)</td>
<td></td>
<td></td>
<td>15.45** (1df)</td>
</tr>
<tr>
<td>Tertiary institution (UWI = 1; ECIAF = 2)</td>
<td></td>
<td></td>
<td>2.52 (1df)</td>
</tr>
<tr>
<td>Residence (Urban = 1; Rural = 2)</td>
<td></td>
<td></td>
<td>0.02 (1df)</td>
</tr>
</tbody>
</table>

“r” based on Spearman’s rho;  \( X^2 \) (df) Chi Square (degrees of freedom)

** Significance at the 0.01 level (2–tailed).  * Significance at the 0.05 level (2–tailed)
Discussion

Students throughout the secondary school system had strong positive perceptions about the importance of agriculture to Trinidad. However, the low likelihood of “prestigious” secondary school students to consider agriculture as a career option suggests a general lack of interest in the discipline from an academic standpoint.

According to Barrick and Hughes (1993), during early adolescence, students are formulating career interest and goals, thus students from “prestigious school” where agriculture was not a component of the curriculum were unlikely to consider the discipline as a career option. In spite of the belief that, if one exposes younger students to pre–secondary agricultural education, one can develop a positive association with agriculture (Perritt & Morton, 1990), the failure to include agriculture in the curriculum across the educational system in Trinidad would further highlight the stigma. Thompson and Russell (1993) indicated that students who have taken coursework in agriculture expressed more favorable beliefs about agricultural careers and are more inclined to consider agriculture as an area of study than those students without such exposure. Donnermeyer and Kreps (1994) found that students already exposed to agriculture tended to enroll in agriculture more often than students without exposure.

The present study found that, although there was an overall positive attitude of students in the “non–prestigious” secondary schools to agriculture, there was only moderate indication that they would pursue a career in agriculture. Krueger and Riesenberg (1991) reported that student misperceptions of the agricultural industry and agricultural opportunities may negatively affect recruitment. The negative perception of careers in agriculture among high school students were also related to student lack of awareness of the range of career opportunities in agriculture and the perception as agriculture involving farming alone (Mallory & Sommer, 1986). The perceived future value of careers and opportunities in agriculture as not rewarding may also be deterrents to the likelihood of the discipline for career pursuits regardless of the student’s exposure to the discipline in the “non–prestigious” school system. Muir–Leresche and Scull–Carvalho (2006) stated that the major focus of tertiary agricultural education has been on the production of public sector employees. This statement is supported by the findings of this study, and this aspect can negatively impact agricultural development in Trinidad.

Enhancing the attractiveness of the agriculture sector through the establishment of rewarding careers and the modernization of agriculture to be technology–driven can attempt to diminish this negative perception and provide lucrative employment. Modernization of the agriculture curriculum for secondary schools would be an immediate first step. Moreover, the creation of a facilitating environment by the government for young tertiary-level graduates such as soft loans and easier access to land may help encourage them to move away from academic and career agriculture in the public service to become professional farmers.

The study also found that rural youth were less inclined to continue a career in agriculture than their urban respondents at the secondary level. Bajema, Miller, and Williams (2002) indicated that researchers have reported lower academic and occupational aspirations for rural youth than their urban peers. It may seem that rural youth are no longer content simply to follow careers in agriculture, that agriculture should be the only option for them because of where they live. The south–based schools, which are generally rural in Trinidad, may have a similar explanation. General increased awareness through increased access to the internet in schools may have alerted rural students to the wider range of alternative careers available to them. Barcins (1989) previously concluded that urban students have higher educational and occupational aspirations than rural students, and their indication pursue agriculture careers cannot be taken too strongly based on the moderate mean (2.57) “likelihood to pursue agriculture” score. Parental pressures and other more lucrative and fashionable career options may pull them away from agriculture at decision time.

The positive meaningful relationships between career aspirations and likelihood to continue careers in agriculture for tertiary–level students were not unexpected. The desire to make a difference to the agriculture sector was a prominent influence which suggested that students had a desire to improve agriculture in Trinidad. Type of institution (ECIAF; UWI) and
residential area (rural; urban) did not separate students on the “likelihood to continue career” question, but they were separated on gender. Female students, both in the secondary school system and tertiary system, were more likely to continue agriculture careers. Absolutely nothing is wrong with this, given that agriculture is moving away from being muscle-driven to brain-driven. This is a welcomed finding, given that historically, females were less inclined to pursue agriculture for socio-cultural reasons. However, some action is still needed to have males enter the sector in larger numbers.

Conclusion and Recommendations

Students’ lack of exposure to agriculture in all schools is an initial deterrent to some students pursuing agriculture as a future career. In schools where agriculture is taught, the present curriculum is structured in such a manner that students spend fairly long periods of time in the hot sun using traditional labor intensive technologies. This is a further disincentive to students changing their perception of agriculture and thus wanting to continue a career in the field. For those students who study agriculture at the tertiary level, the major aspirations are to get a salaried position and to study for advanced degrees in agriculture. There is a serious gender issue to be addressed, whereby males, both at the secondary and tertiary levels, were less likely to continue into a career in agriculture. Notwithstanding the important contribution females can make, more males need to be encouraged.

Development of the sector would be seriously stymied if actions are not taken to correct this situation. While the country needs academics in the field, it also requires persons disposed to “scientific farming” that is individuals educated to the diploma and bachelor’s level and who engage knowledge based farming using modern technologies and with a business-like approach. The development of a cadre of successful, professional farmers will have the effect of changing students’ perceptions of agriculture and more may seek to pursue agriculture a preferred career choice.

Some actions to further promote agriculture as a rewarding career include policy initiatives to introduce agriculture as a science to all students in the formal education system. Furthermore a re-engineered curriculum based on the use of modern technology, would serve to de-stigmatize its perception as a discipline for weaker, rural–based students and thus all students can meaningfully consider it for post-secondary study and career aspirations. Specially developed career days, exhibitions, and field visits promoting agriculture as a viable and rewarding career choice would contribute to changing perceptions. Technology–driven farms as demonstration units would also be useful.

On the national level, general increased public awareness about food security, national food production interests, and re-defining agriculture as a professional discipline would change the adult population’s negative perception about agriculture and this may impact on their children’s choice of career.

References


Barcinas, J. D. T. (1989). Comparison of rural and urban secondary schools and the twelfth–grade students in Ohio. (Unpublished doctoral dissertation). The Ohio State University, Columbus, OH.


MARCUS N. A. RAMDWAR is an Instructor II in the Department of Biotechnology, Agriculture and Food Production Technologies at the University of Trinidad and Tobago, Caroni North Bank Road, Centeno, Trinidad and Tobago, marcusramdwar@tstt.net.tt
WAYNE G. GANPAT is a lecturer of Agricultural Extension in the Department of Agricultural Economics & Extension, The University of the West Indies, St. Augustine, Trinidad and Tobago, waygan@flowtrinidad.net

Authors’ Note
The authors would like to thank Mr. Bruce Lauckner and Mr. Marcus Jones of the Caribbean Agricultural Research and Development Institute (CARDI) for assistance with the data analysis.
The Relationship Between Teacher Self-Efficacy and the Professional Development Experiences of Agricultural Education Teachers Candidates

Kattlyn J. Wolf, Assistant Professor
University of Idaho
Daniel D. Foster, Assistant Professor
The Pennsylvania State University
Robert J. Birkenholz, Professor
The Ohio State University

The purpose of this study was to examine the relationship between the professional experiences of agricultural education teacher candidates during their internship, their sense of teacher self-efficacy, and their perceptions of their preparation. The population included the entire cohort (n=24) of teacher candidates during the 2007 fall quarter at The Ohio State University. Teacher self-efficacy was measured using the Teacher Sense of Efficacy Scale (Tschannen-Moran & Woolfolk Hoy, 2001). Candidates reported high levels of teacher self-efficacy at the end of the experience. The candidates’ perception of their level of preparation was similar to their sense of teacher self-efficacy. The largest discrepancy score was for the student engagement domain. Professional development experiences categorized as vicarious experiences revealed the strongest overall relationship with teacher self-efficacy. The experience of observing a first-year agriculture teacher had the strongest positive relationship with overall teacher self-efficacy. This variable explained 11 percent of the variance in overall teacher self-efficacy, and 14 percent of the variance in the instructional strategies domain. Verbal feedback that candidates received from their cooperating teacher was positively related to teacher self-efficacy. The number of courses teacher candidates taught was negatively related to their sense of efficacy in the classroom management domain.

Keywords: teacher self-efficacy, teacher efficacy, professional development, teacher preparation

Introduction/Theoretical Foundation

Secondary agricultural education in the U.S. faces a crisis due to a shortage of qualified, dedicated, and passionate teachers. According to a recent supply and demand study, only 69.8% of newly-qualified graduates in agricultural education enter teaching, and a number of secondary agricultural education programs have closed due to a lack of qualified instructors (Kantrovich, 2007). The shortage of qualified teachers has been further complicated by the National Council for Agricultural Education’s 10X15 initiative. This initiative envisions 10,000 quality agricultural education programs in the U.S. by the year 2015. One goal, specific to recruiting highly-qualified educators is to “meet the demand for well-trained, highly qualified agricultural educators for all roles within the profession and encourage their involvement in appropriate professional organizations” (Team Ag Ed, 2007, p. 18). Therefore, a challenge to the agricultural education profession involves simultaneously remediating the shortage of qualified professionals and preparing even more qualified agricultural educators to meet the goals of the 10X15 initiative. Overcoming the teacher shortage may involve the preparation of future teachers who believe they have the potential for success as an agricultural educator. Investigating personal characteristics associated with teacher
success in the profession may also contribute to improved teacher retention. Therefore, this investigation of teacher self-efficacy will aid agricultural educators as they attempt to prepare and retain more and better teachers.

Bandura’s social cognitive theory (Bandura, 1986) and the associated theory of self-efficacy (Bandura, 1997) provided the theoretical foundation for this study. Social cognitive theory explains how people acquire and maintain certain behavioral patterns (Bandura, 1986). The concept of individuals having the potential to influence change, regardless of their skill level, is central to social cognitive theory (Pajares, 2002). Bandura regarded self-efficacy as one of the most important factors contributing to an individual’s behavior based upon social cognitive theory. “Beliefs of personal efficacy constitute the key factor of human agency. If people believe they have no power to produce results, they will not attempt to make things happen” (Bandura, 1997, p. 3). Perceived self-efficacy was defined as

... people’s judgments of their capabilities to organize and execute courses of action required to attain designated types of performances. It is concerned not with the skills one has but with judgments of what one can do with whatever skills one possesses (Bandura, 1986, p. 391).

Bandura (1994) suggested that individual self-efficacy is derived from four main sources: mastery experiences, physiological and emotional arousal, vicarious experiences, and social persuasion. Mastery experiences are generally considered to be the most effective way to foster a stronger sense of self-efficacy. Bandura described an individual experiencing success at a task as building self-efficacy while failure undermines the sense of self-efficacy. Physiological and emotional arousal also affects the sense of self-efficacy. When a person can reduce their stress reactions and alter negative tendencies in the face of adversity, their sense of self-efficacy increases. Vicarious experiences involve observing others succeed at a task, which may raise the belief that the observer could also succeed in performing the task. Social persuasion occurs when an individual is convinced or persuaded that they have the capabilities to be successful at a task.

Self-efficacy studied in the context of teachers and teaching has been labeled Teacher Self-Efficacy. Tschanzen-Moran and Woolfolk Hoy (2001) defined teacher self-efficacy as “... a judgment about his or her capabilities to bring about desired outcomes of student engagement and learning, even among those students who may be difficult or unmotivated” (p. 1). Like self-efficacy, teacher self-efficacy is derived from the four sources: mastery experiences, physiological and emotional arousal, vicarious experiences, and social persuasion (Bandura, 1994). Teachers with a high sense of teacher self-efficacy believe that students who are unmotivated are still teachable through extra effort and that the teacher can enlist support from the school, the student’s family, or the community to influence the student. Teachers with a low sense of teacher self-efficacy believe that little can be done to reach unmotivated students, and the teachers’ influence is limited by environmental factors. A teacher with a high sense of teacher self-efficacy would be more likely to create dynamic, student-centered learning environments where students take ownership of their learning whereas a teacher with a low sense of teacher self-efficacy would devote more time to non-academic, managerial tasks (Bandura, 1997). Raudenbush, Rowan, and Cheong (1992) considered teacher self-efficacy to be contextually situated, varying from class to class or by student ability level.

Knobloch (2001) reported that early field experiences and teaching peers influenced teacher candidates’ sense of teacher self-efficacy. The researcher suggested that students become more efficacious about their teaching because they observed and experienced teaching in real settings, and had taught their peers. Knobloch and Whittington (2003b) studied the self-efficacy of student, first-, second-, and third-year teachers after the first ten weeks of school. Student teachers were the only group that experienced an increase in self-efficacy during the first ten week period while first-year teachers experienced the greatest decline.

Career commitment is a factor that is related to teacher self-efficacy (Knobloch & Whittington 2003a), in addition to contract length, the number of students, and years of teaching experience (Wheeler & Knobloch, 2006). Career commitment was positively related to teacher self-efficacy, while contract
length and years of teaching were both negatively associated with teacher self-efficacy. However, in another study, Whittington, McConnell, and Knobloch (2006) found no differences in teacher self-efficacy based on the participant’s years of teaching experience. Forty-two teacher characteristics were examined; however, only two of the variables accounted for a significant portion of the explained variance (33%) in the teacher self-efficacy score, the quality of the student teaching experience, and the number of class preparations.

Roberts, Harlin, & Ricketts (2006) assessed teacher self-efficacy of student teachers at four different points during a 15-week student teaching experience. The researchers examined the three domains (student engagement, instructional strategies, and classroom management) identified by Tschannen-Moran and Woolfolk Hoy (2001). In the student engagement domain, students’ scores dropped in the middle of the experience and were highest at the end of the experience. The instructional strategies domain exhibited a similar pattern. The changes were less pronounced in the classroom management domain but followed the same pattern as the other two domains. The researchers observed that “... limited knowledge exists about teaching efficacy of preservice agricultural science teachers, largely due to the paucity of research in this area. Existing research has largely been conducted by just a few researchers, in only a few states” (Roberts, et al., 2006, p. 84). This view was corroborated by a later study that measured teacher self-efficacy of agricultural education teacher candidates at four institutions (Harlin, Roberts, Briers, Mowen, & Edgar, 2007). The candidates studied exhibited the same pattern of change in their teacher self-efficacy, with a drop in scores toward the middle of the experience, and increased scores at the end. Roberts, Mowen, Edgar, Harlin, and Briers (2007) found a negligible relationship between teacher self-efficacy and personality type, supporting Bandura’s (1994) assertion that efficacy is a result of experiences rather than based on personality type.

Knobloch (2006) found that student teachers at two different institutions reported similarly high levels of teaching self-efficacy; however, they differed in their perception of environmental factors that contributed to teacher self-efficacy. The environmental factors were: supportive principal behaviors, cooperating teacher competence, and number of class preparations. Knobloch speculated that student teachers may have had an inflated sense of teacher self-efficacy which remained inflated throughout the student teaching experience as a result of support from the cooperating teacher.

Rocca and Washburn (2006) investigated differences in self-efficacy between traditionally and alternatively certified teachers. The two groups did not differ in their perceived self-efficacy; however, alternatively certified teachers were about ten years older than traditionally certified teachers. The researchers questioned why the two groups were similar in their level of self-efficacy since the alternatively certified teachers did not have formal training in education. However, they did not question the age difference of the two groups, nor did they attribute the results to the age difference of the alternatively certified teachers.

In a study of student teachers, Wolf, Birkenholz, and Foster (2007) sought to describe agricultural education teacher candidates’ sense of teacher self-efficacy in classroom management. The researchers found that student teachers were the most efficacious in the classroom management and discipline domain, slightly less efficacious in the personal teaching efficacy domain, and least efficacious in the external influences domain. Only one leadership characteristic (participation in the Boy/Girl Scouts) explained a significant portion of the variance in the classroom management and discipline domain of teacher self-efficacy. The researchers concluded that teacher self-efficacy was not influenced by prior leadership experiences of teacher candidates, and other factors may have contributed to and affected teacher self-efficacy during the student teaching internship.

Duncan and Ricketts (2008) postulated that the research on teacher self-efficacy in agricultural education was limited to general pedagogical topics; therefore, a more specific measure was needed to describe the teacher self-efficacy of secondary agricultural educators accurately. The researchers utilized a modified Borich needs assessment model using the following variables: technical agriculture content, FFA/leadership development/SAE,
The purpose of this study was to examine the relationship between the professional experiences of agricultural education teacher candidates during their internship, their sense of teacher self-efficacy, and their perceptions of their preparation.

1. Describe agricultural education teacher candidate perceptions of their teacher self-efficacy at the conclusion of their student teaching internship.
2. Describe agricultural education teacher candidate perceptions of their preparation.
3. Determine the discrepancy between agricultural education teacher candidates’ perceived sense of teacher self-efficacy and level of preparation.
4. Describe the type and scope of professional activities of agricultural education teacher candidates during their student teaching internship.
5. Describe the relationship between the professional activities of agricultural education teacher candidates’ during student teaching and their sense of teacher self-efficacy.

Methods

The population for this descriptive study was comprised of the entire cohort (N = 24) of agricultural education student teacher candidates at The Ohio State University who completed their student teaching internship during Autumn Quarter, 2007. The population frame was identified by the faculty coordinator of the student teaching internship.

The researchers utilized the Teacher Sense of Efficacy Scale [TSES] (Tschannen-Moran, Woolfolk Hoy, & Hoy, 1998; Tschannen-Moran & Woolfolk Hoy, 2001) to assess the perceived teacher self-efficacy of agricultural education student teacher candidates. This study utilized the long summated rating scale (24 items) consisting of three distinct domains: efficacy for instructional strategies (8 items), efficacy for classroom management (8 items), and efficacy for student engagement (8 items). The published reliabilities for each domain were 0.91, 0.90, and 0.87, respectively. Items were added to assess candidates’ perceptions of their preparation in the items on the TSES, similar to the Borich (1980) needs assessment model. The efficacy items asked teacher candidates to rate their level of capability on each item using the following scale: 1 = None, 3 = Very little, 5 = Some, 7 = Quite a bit, and 9 = A great deal. The preparation items asked teacher candidates to rate their level of capability on each item using the following scale: 1 = Not prepared, 3 = Slightly prepared, 5 = Fairly well prepared, 7 = Well prepared, and 9 = Very well prepared. Discrepancy scores were calculated for each of the three domains (efficacy for instructional strategies, efficacy for classroom management, and efficacy for student engagement) by subtracting the mean preparation score from the mean teacher self-efficacy score.

Demographic questions were added to the instrument to quantify professional activities during the student teaching internship and categorized according to three of Bandura’s
Wolf, Foster, & Birkenholz  The Relationship Between…

(1994) four sources of self-efficacy: mastery experiences, vicarious experiences, and social persuasion. Physiological and emotional arousal was not assessed in this study as it is a construct that does not lend itself to measurement on a survey instrument. Professional development experiences included a list of assignments and typical roles/responsibilities of student teachers in agricultural education. Candidates were asked to report their level of involvement in each experience. The instrument was reviewed by a panel of experts to address face and content validity. Twenty-four students (100%) completed the survey instrument during an on-campus course after completing their student teaching internship. Descriptive statistic and Pearson product-moment correlation coefficient were used to address the research questions. Davis's (1971) conventions were used to describe the relationship between the variables.

Findings/Results

The population consisted of 24 agricultural education teacher candidates. Two-thirds of the respondents were female and one-third were male. The candidates were 21 to 26 years of age.

The first research objective was to describe agricultural education teacher candidates’ sense of teacher self-efficacy in three domains (efficacy for instructional strategies, efficacy for classroom management, and efficacy for student engagement) at the conclusion of their student teaching internship (see Table 1). The summed mean of the candidates’ perceptions of overall teacher self-efficacy at the end of their clinical experience was 7.30 (on a nine point summated rating scale). The lowest summed mean score of 7.14 was in the student engagement domain. The highest summed mean score ($\mu = 7.38$) was in the classroom management domain, although it was nearly equal to the instructional strategies domain.

<table>
<thead>
<tr>
<th>Domain</th>
<th>Perceptions of teacher self-efficacy</th>
<th>Level of preparation</th>
<th>Discrepancy score</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$\mu^a$</td>
<td>$\Sigma$</td>
<td>$\mu^b$</td>
</tr>
<tr>
<td>Student engagement</td>
<td>7.14</td>
<td>1.05</td>
<td>6.22</td>
</tr>
<tr>
<td>Classroom management</td>
<td>7.38</td>
<td>1.11</td>
<td>6.72</td>
</tr>
<tr>
<td>Instructional strategies</td>
<td>7.37</td>
<td>1.00</td>
<td>6.72</td>
</tr>
<tr>
<td>Overall</td>
<td>7.30</td>
<td>0.99</td>
<td>6.55</td>
</tr>
</tbody>
</table>

$^a$ 1 = None to 9 = A Great Deal  
$^b$ 1 = Not Prepared to 9 = Very Well Prepared

The second research objective was to describe agricultural education teacher candidates’ perceptions of their preparation in the three domains of teacher self-efficacy. As indicated in Table 1, the lowest summed mean score of 6.22 was in the student engagement domain. The highest summed mean score of 6.72 was computed for both the classroom management and instructional strategies domains.

The third research objective was to determine the discrepancy between agricultural education teacher candidate teacher self-efficacy scores and their perceived preparation scores. The discrepancy score between the summed overall mean of the teacher self-efficacy scores and the summed overall mean of the level of preparation scores was 0.75. The largest discrepancy score was in the Student Engagement domain. This domain also produced the lowest summed mean ($\mu = 7.14$) of the three domains of teacher self-efficacy and the lowest level of preparation score ($\mu = 6.22$) compared to the other two domains.

The fourth research objective was to describe the type and scope of professional activities of agricultural education teacher candidates during their student teaching internship categorized according to three of Bandura’s (1994) four sources of self-efficacy. Table 2 reports the range...
and variability associated with student teacher involvement in each activity. Activities with the greatest variability included the number of class periods observing cooperating teachers and the percent of time students received verbal feedback from cooperating teachers on classroom instruction.

Table 2
Professional Experiences by Source of Self-Efficacy

<table>
<thead>
<tr>
<th>Source of Teacher Self-Efficacy</th>
<th>Min(^a)</th>
<th>Max(^a)</th>
<th>(\mu)</th>
<th>(\sigma)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mastery Experiences</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of different courses involved in teaching</td>
<td>2.0</td>
<td>7.0</td>
<td>3.9</td>
<td>1.3</td>
</tr>
<tr>
<td>Maximum course load at any one time</td>
<td>3.0</td>
<td>7.0</td>
<td>5.0</td>
<td>1.4</td>
</tr>
<tr>
<td>Vicarious Experiences</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Class periods observing cooperating teacher(s)</td>
<td>2.0</td>
<td>170.0</td>
<td>32.0</td>
<td>40.2</td>
</tr>
<tr>
<td>Class periods observing another agriculture teacher (not cooperating teacher)</td>
<td>0.0</td>
<td>35.0</td>
<td>3.4</td>
<td>7.9</td>
</tr>
<tr>
<td>Class periods observing a first year agriculture teacher</td>
<td>0.0</td>
<td>8.0</td>
<td>2.2</td>
<td>1.9</td>
</tr>
<tr>
<td>Class periods observing another student teacher</td>
<td>1.0</td>
<td>8.0</td>
<td>2.4</td>
<td>1.9</td>
</tr>
<tr>
<td>Class periods observing a non-agriculture teacher (Grade 6 &amp; below)</td>
<td>0.0</td>
<td>5.0</td>
<td>0.9</td>
<td>1.1</td>
</tr>
<tr>
<td>Class periods observing a non-agriculture teacher (Grade 7 &amp; above)</td>
<td>0.0</td>
<td>5.0</td>
<td>2.1</td>
<td>1.2</td>
</tr>
<tr>
<td>Social Persuasion</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of times received written feedback received from cooperating teacher</td>
<td>0.0</td>
<td>10.0</td>
<td>3.2</td>
<td>3.4</td>
</tr>
<tr>
<td>Percent of time received verbal feedback from cooperating teacher</td>
<td>2.00</td>
<td>100.0</td>
<td>63.7</td>
<td>33.9</td>
</tr>
<tr>
<td>Class periods observed by another student teacher</td>
<td>0.0</td>
<td>7.0</td>
<td>1.4</td>
<td>2.0</td>
</tr>
</tbody>
</table>

\(^a\)Measurement units are referenced in each stem statement (e.g. courses, periods, etc.).

The fifth research objective was to describe the relationship between the professional activities of agricultural education teacher candidates and their sense of teacher self-efficacy. The mastery experience item *number of different courses involved in teaching* had the strongest negative relationship with the domain of classroom management \((r^2 = -0.05)\). Only five percent of the variance in classroom management was explained by the number of courses the candidates taught. No other relationship of notable strength was observed between other mastery experiences and teacher self-efficacy, although all of the mastery experiences were negatively related to teacher self-efficacy.

Most of the vicarious experiences had a positive relationship with teacher self-efficacy. The strongest positive relationship was between the number of class periods the candidates spent observing a first-year agriculture teacher \((r^2 = 0.14)\) and the domain of instructional strategies; therefore, 14 percent of the variance in the instructional strategies domain was explained by the candidates’ observations of a first-year teacher. Also, observing a first-year agriculture teacher \((r^2 = 0.11)\) explained 11 percent of the variance in the overall teacher self-efficacy score. Observing a non-agriculture teacher (grades 6 and below) explained 12 percent \((r^2 = 0.12)\) of the variance in the classroom management domain, and 10 percent of the variance in overall teacher self-efficacy. Observing another student teacher \((r^2 = 0.10)\) explained 10 percent of the variance in the student engagement domain and 10 percent of the variance in overall teacher self-efficacy.

The strongest relationship between professional development experiences categorized under social persuasion was the percent of time the candidate received verbal feedback and the domain of instructional strategies \((r^2 = 0.10)\), explaining ten percent of the variance. The variable of verbal feedback was the only notable relationship of the social persuasion experiences, explaining ten percent of the variance in overall teacher self-efficacy.
The purpose of this study was to examine the relationship between the professional experiences of agricultural education teacher candidates during their internship, their sense of teacher self-efficacy and their perceptions of their preparation. The concept of teacher self-efficacy involves the individual's teacher's belief that their performance has the potential to influence the ultimate level of achievement realized by their students. Teacher candidates in this study were most efficacious about classroom management, slightly less efficacious about instructional strategies, and the least efficacious about student engagement. Based on these findings, the candidates in this study perceived that they were able to influence student achievement in their program.

Teacher candidates’ perceptions of their level of preparation were also assessed in this study. Candidates reported favorable views of their preparation, although their perception of the level of preparation was lower than their perceived sense of teacher self-efficacy. Teacher candidates reported the lowest levels of preparation in the student engagement domain and higher levels of preparation in the instructional strategies and classroom management domains; the latter two being nearly equal. Since the level of preparation scores and the teacher self-efficacy scores of the teacher candidates paralleled one another, the researchers concluded that the preparation of agricultural education teacher candidates coincided with their sense of teacher self-efficacy.

In addition to identifying candidate perceptions of teacher-self efficacy and the level of their preparation, this study also examined the discrepancy between the two variables. The largest discrepancy score was in the student engagement domain while the classroom management and instructional strategies domain

### Table 3

<table>
<thead>
<tr>
<th>Source of Teacher Self-Efficacy</th>
<th>Teacher Self-Efficacy</th>
<th>CM (\rho (r^2))</th>
<th>SE (\rho (r^2))</th>
<th>IS (\rho (r^2))</th>
<th>TSE (\rho (r^2))</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mastery Experiences</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of different courses involved in teaching</td>
<td>-.22 (.05)</td>
<td>-.2 (.04)</td>
<td>-.08 (.00)</td>
<td>-.18 (.03)</td>
<td></td>
</tr>
<tr>
<td>Maximum course load at any one time</td>
<td>-.03 (.00)</td>
<td>-.05 (.00)</td>
<td>-.03 (.00)</td>
<td>-.04 (.00)</td>
<td></td>
</tr>
<tr>
<td><strong>Vicarious Experiences</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Class periods observing cooperating teacher(s)</td>
<td>.08 (.01)</td>
<td>.16 (.03)</td>
<td>.06 (.00)</td>
<td>.10 (.01)</td>
<td></td>
</tr>
<tr>
<td>Class periods observing another agriculture teacher (not cooperating teacher)</td>
<td>.1 (.01)</td>
<td>.17 (.03)</td>
<td>.04 (.00)</td>
<td>.11 (.01)</td>
<td></td>
</tr>
<tr>
<td>Class periods observing a first year agriculture teacher</td>
<td>.27 (.07)</td>
<td>.3 (.09)</td>
<td>.37 (.14)</td>
<td>.33 (.11)</td>
<td></td>
</tr>
<tr>
<td>Class periods observing another student teacher</td>
<td>.27 (.07)</td>
<td>.32 (.10)</td>
<td>.31 (.10)</td>
<td>.32 (.10)</td>
<td></td>
</tr>
<tr>
<td>Class periods observing a non-agriculture teacher (Grade 6 and below)</td>
<td>.35 (.12)</td>
<td>.33 (.10)</td>
<td>.19 (.04)</td>
<td>.31 (.10)</td>
<td></td>
</tr>
<tr>
<td>Class periods observing a non-agriculture teacher (Grade 7 and above)</td>
<td>-.00 (.00)</td>
<td>.16 (.03)</td>
<td>.12 (.01)</td>
<td>.1 (.01)</td>
<td></td>
</tr>
<tr>
<td><strong>Social Persuasion</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of times received written feedback received from cooperating teacher</td>
<td>.08 (.01)</td>
<td>.06 (.00)</td>
<td>.09 (.01)</td>
<td>.08 (.01)</td>
<td></td>
</tr>
<tr>
<td>Percent of time received verbal feedback from cooperating teacher</td>
<td>.29 (.08)</td>
<td>.27 (.07)</td>
<td>.32 (.10)</td>
<td>.31 (.10)</td>
<td></td>
</tr>
<tr>
<td>Class periods observed by another student teacher</td>
<td>.08 (.01)</td>
<td>-.07 (.00)</td>
<td>-.01 (.00)</td>
<td>.00 (.00)</td>
<td></td>
</tr>
</tbody>
</table>

**Note.** CM- Classroom Management; SE- Student Engagement; IS- Instructional Strategies; TSE- Teacher Self-Efficacy
discrepancy scores were nearly equal. In all three domains, it was interesting to note that the level of preparation mirrored the candidates teaching self-efficacy scores. However, for the student engagement domain, a lower level of preparation score contributed to a larger discrepancy score.

Agricultural education teacher candidates in this study engaged in professional activities to varying levels during their student teaching internship. The experiences were categorized into three of Bandura’s (1994) four sources of self-efficacy: mastery experiences, vicarious experiences, and social persuasion. Professional activities exhibiting the greatest variability were the number of class periods that candidates spent observed their cooperating teacher and the percent of time they received verbal feedback from their cooperating teacher on their classroom instruction.

One objective of this study was to describe the relationship between activities that candidates engaged in during their student teaching internship and their sense of teacher self-efficacy. The strongest positive relationship was between the instructional strategies domain and observing a first-year agriculture teacher (vicarious experience). Three vicarious experiences exhibited moderate (Davis, 1971) positive relationships with overall teacher self-efficacy: observing a first year agriculture teacher, observing another student teacher, and observing a non-agriculture teacher (grade 6 and below). However, observing a cooperating teacher and observing another agriculture teacher (not a first year agriculture teacher) reflected a negligible relationship with teacher self-efficacy. The researchers concluded that student teacher candidates may view experienced teachers as more capable and therefore somewhat intimidating whereas the student teacher candidates may have related more closely to novice teachers and peers in their student teaching cohort group.

Bandura (1994) noted that it was essential for an individual modeling a behavior to ensure that the level of performance is reachable by the observer. The researchers speculate that the level of performance candidates observed in first-year teachers, their peers, and non-agriculture teachers may have been more attainable and, therefore, may have positively affected their teacher self-efficacy. The professional development experience of observing non-agriculture teachers (grade 6 and below) had a lower relationship with the instructional strategies domain compared to the other two domains and overall teacher self-efficacy. The researchers speculate that candidates did not relate as well to the instructional strategies used by elementary teachers; therefore, this experience did not affect the domain of instructional strategies. However, candidates seemed to benefit in the classroom management and student engagement domains as a result of observing elementary school teachers.

It was interesting to note that each of the professional experiences categorized as mastery experiences had negative relationships with all three domains of teacher self-efficacy. The strongest negative relationship was between the number of courses a candidate was involved in teaching and the classroom management domain. This may indicate that candidates may have been teaching too many courses at one time to develop a sense of teacher-efficacy about their classroom management performance. Bandura (1994) regarded mastery experiences as the most important source of self-efficacy; however the results of this study indicate that there may be a point of diminishing returns of teacher self-efficacy if candidates are involved in teaching too many courses.

The type of feedback that candidates receive may also be an important factor in their level of teacher self-efficacy. Written feedback from the cooperating teacher was not related to teacher self-efficacy. This finding supports Edgar, Roberts, & Murphy’s (2009) finding that structured communication did not create a change in student teachers sense of efficacy. However, verbal feedback from the cooperating teacher had a moderate positive relationship to the candidates teacher self-efficacy score in the instructional strategies domain and overall teacher self-efficacy. This feedback may enable teacher candidates to refine and improve their instructional strategies, thereby increasing their sense of self-efficacy. Written feedback that cooperating teachers are asked to complete for the teacher preparation program is structured and on a standardized form and therefore may not be as pertinent to the candidates. Verbal feedback may be more immediate and less formal than written feedback, and therefore
more likely to impact the candidates’ sense of teacher self-efficacy.

The researchers recommend more verbal feedback from cooperating teachers during the student teaching internship at the institution where the research was conducted. Candidates should also observe a variety of other teachers and classes, especially elementary classrooms. Cooperating teachers should also exercise caution to avoid overloading teacher candidates with too many classes which may result in situations where candidates are not able to succeed, thereby affecting their sense of teacher self-efficacy. It would be more beneficial to ensure that candidates are successful in one class before adding another course assignment to their teaching load. Candidates should be encouraged to observe other teachers performing at a level that is attainable by candidates, rather than at levels unattainable by the candidates.

The findings presented in this study raise many questions relative to teacher self-efficacy. Does early teaching experience help build efficacy, and to what degree? Do particular assignments help build efficacy? Are there experiences during the student teaching internship that were not measured in this study that affect teacher self-efficacy? Why are student teachers the least efficacious in the student engagement domain? How should the student teaching internship be structured to build efficacy?

Additional research is needed in the area of teacher self-efficacy in agricultural education to identify professional experiences that improve teacher self-efficacy. Induction year teacher programs should also be examined to ascertain the effects on teacher self-efficacy. Teacher educators and professional development personnel need this information to better understand teacher self-efficacy in order to prepare and retain more and better teachers in secondary agricultural education programs.

References


KATTLYN J. WOLF is an Assistant Professor in the Department of Agricultural and Extension Education at the University of Idaho, 1134 West 6th St., Moscow, ID 83844, kwolf@uidaho.edu

DANIEL D. FOSTER is an Assistant Professor in the Department of Agricultural and Extension Education at Penn State, 211 Ferguson Building, University Park, PA 16802, ddf12@psu.edu

ROBERT B. BIRKENHOLZ is a Professor in the Department of Human and Community Resource Development at The Ohio State University, 208 Agricultural Administration Building 2120 Fyffe Rd, Columbus, OH 43210, birkenholz.1@osu.edu
Teaching Partnerships: The Use of Peer Facilitators in the College Classroom

Jonathan J. Velez, Assistant Professor
Oregon State University
Jon C. Simonsen, Assistant Professor
University of Missouri
Jamie Cano, Associate Professor
The Ohio State University
James J. Connors, Associate Professor and Chair
University of Idaho

This study sought to qualitatively examine an undergraduate faculty teaching partnership in an agricultural and extension education leadership course. The researchers implemented peer facilitation for the purposes of examining the student and peer facilitator perceptions to the peer facilitation process. Utilizing a social constructivist epistemology, the researchers conducted discourse analysis, content analysis, and interviews to address the research questions. Results revealed three emergent student themes of enhanced educational opportunities, relational benefits of peer facilitation, and student concern for the selection and roles of the peer facilitator. Analysis of the peer facilitator data revealed areas for potential change, areas of recognized student skill development, and perceptions of the unique contributions of the peer facilitation process. Both the students and the peer facilitators recognized areas for improvement and offered suggestions relating to the procedural development and instructor support of the peer facilitation process.

Keywords: peer facilitators, leadership, undergraduate faculty teaching partnership, peer learning

Introduction

The era of dwindling budgets and increased professional demands necessitates a reexamination of ways to optimize student involvement and facilitate increased learning. One way to enhance student involvement and learning may be through the use of student–assisted teaching. Student–assisted teaching is not a new concept in educational arenas.

Aristotle recognized the benefits of peer instruction long before the advent of empirical published research (Wagner, 1982). In 1789, Andrew Bell, attempted to circumvent disgruntled faculty by implementing a peer–led educational model, and by 1817, around 100,000 school children around England and Wales were being educated in a peer led manner (Fuchs, Fuchs, Mathes, & Simmons, 1997; Topping, 1998).

According to Miller, Groccia, and Miller (2001), students are an underused, renewable resource who hold the potential to positively impact and shape the learning environment. Despite the tradition of peer utilization in the classroom, there is very little qualitative research which examines the more holistic impact of student–assisted teaching. Now, more than ever, research regarding the use of peers to support the learning of other students is warranted.

Theoretical Foundation

The educational theories espoused by both Vygotsky and Piaget established a foundation for student–assisted teaching. Vygotsky (1978) focused his Sociocultural Theory on the social process as a mechanism for learning. Vygotsky believed the development of higher mental function was a result of social interaction (Palinscar, 1998).

One of Vygotsky’s foundational tenets, which provided a basis for student–assisted teaching, was the concept of a zone of proximal
development (ZPD). Vygotsky argued for the existence of two developmental levels, the actual and potential levels of development. According to Palinscar (1998), the actual, “refers to those accomplishments a child can demonstrate alone or perform independently,” (p. 352-353) whereas the potential level describes, “what children can do with assistance” (p. 353). The zone of proximal development refers to those tasks that fall within the potential category (Vygotsky, 1978).

Vygotsky believed a key element to successful learning was interaction with a more knowledgeable peer or adult. According to his theory, the more knowledgeable expert has the ability to structure or frame the dialogue in such a manner as to stimulate optimal learning (Palinscar, 1998). The longer the learner is exposed to the more knowledgeable individual, the greater the likelihood that the task will transfer from the potential to the actual level of development. Vygotsky (1978) firmly believed that peer collaboration and various forms of peer-assisted teaching have the opportunity to positively enhance student learning.

Relatedly, the theory of Jean Piaget corresponds in certain aspects to the ideas of Vygotsky. Piaget’s Theory of Cognitive Development, while less focused on social interaction, still stressed the importance of peers in the learning process (O’Donnell & O’Kelly, 1994; Piaget, 1965, 1985). Piaget identified three conditions which allow for equilibration to occur in intellectual exchange (Tudge & Rogoff, 1989). According to Piaget, partners must have a common scale for intellectual understandings, be able to conserve their own ideas without contradiction, and establish a condition of mutuality (O’Donnell & O’Kelly, 1994; Piaget, 1965, 1985). All three of Piaget’s conditions can be facilitated by peer-to-peer interaction.

The theoretical basis for student-assisted instruction encourages the synthesis of the social and cognitive theories of Vygotsky and Piaget. Through interaction with others, students may encounter the social and cognitive catalysts to optimize student learning.

**Conceptual Framework**

Learner-centered instruction, grounded in the theories of Vygotsky and Piaget, established the conceptual framework for this study. The impetus for the creation and development of learner-centered instruction can likely be traced to the 1993 American Psychological Association (1993) document The Learner-Centered Psychological Principles: A Framework for School Reform and Redesign, and the Boyer Commissions (1998) publishing of Reinventing Undergraduate Education: A Blueprint for American Research Universities. The component of learner-centered instruction that further guides the conceptual framework is the concept of peer learning or student-assisted teaching (Zophy, 1982).

Topping (2005) defined peer learning as: The acquisition of knowledge and skill through active helping and supporting among status equals or matched companions. It involves people from similar social groupings who are not professional teachers helping each other to learn and learning themselves by so doing. (p. 631)

The terms peer learning, peer-assisted instruction, and student-assisted teaching are often used and defined interchangeably in the literature (Topping, 2005; Topping & Ehly, 1998). Despite the subtle distinctions between the various terms, the underlying commonalities focus on the use of students to enhance the learning of other students.

The researchers focused on, and utilized, the term student-assisted teaching to provide a conceptual basis for this study. Miller, Groccia, and Miller (2001) defined student-assisted teaching as an:

Instructional process where undergraduates are given responsibility by faculty for portions of their fellow undergraduates’ learning experience. The degree of responsibility can vary from incidental assistance on a specific in-class problem or project, to full control over content selection, delivery, and assessment. (p. xv)

While the researchers chose to utilize the concept of student-assisted teaching, for the practical purposes of classroom application, the term peer facilitation was chosen for its presumed benign connotation to students. The researchers believed that the peer facilitator label was potentially less divisive and more
inclusive and welcoming in peer-to-peer interactions.

**Purpose and Research Questions**

The researchers implemented peer facilitation in an undergraduate leadership course and qualitatively examined the student and peer facilitator thoughts in relation to the peer facilitation process. The research questions guiding this study sought to examine the peer facilitation process in two distinct areas:

1. What were the student perceptions of the peer facilitation process?
2. What were the peer facilitators’ perceptions of the peer facilitation process?

**Research Methods**

According to Guba and Lincoln (1989) adherence to the ideals of value–free objectivity is difficult. Guba and Lincoln stated that, “Values enter an inquiry through such channels as the nature of the problem selected for study . . . the choice of paradigm for carrying out the inquiry, . . . the choice of instruments and analysis modes, the choice of interpretations to be made and conclusions to be drawn, and the like” (p. 65). The researchers sought to utilize constructivist epistemology as a framework for discourse analysis methodology, as well as the methodological development of content analysis and interviews.

The research methods chosen are congruent with the epistemological and theoretical perspective of the researchers. Discourse analysis, textual analysis, and focus group interviews all served to elucidate the research data. Eichelberger (1989) described the work of constructivist researchers and stated, “They do a great deal of observation, read documents produced by members of the groups being studied, do extensive formal and informal interviewing, and develop classifications and descriptions that represent the beliefs of the various groups” (p. 9).

**Textual Analysis: Content and Discourse Analysis**

One of the primary methods utilized for data collection was two derivatives of textual analysis: content analysis and discourse analysis. The research participants generated personal reflections concerning their experience with peer facilitators. These non–graded reflections were collected, analyzed, and coded for thematic content. Open, axial and selective coding were utilized for data analysis.

During the duration of the peer facilitation process, the participant researcher engaged in observation of the student–peer facilitator interaction. Field notes were taken with the goal of analyzing student–peer facilitator interaction. The discourse notes were analyzed and coded for thematic content relating to the research objectives.

**Interviews: Focus Group and Individual**

Focus group interviews were conducted with the six peer facilitators. Two semi–formal interviews and one formal group interview were conducted. The semi–formal interviews consisted of open ended discussion pertaining to the peer facilitation process and the formal interview consisted of open–ended questions, generated by the researchers, designed to solicit the facilitator perceptions of the peer facilitator process. The participant researcher conducted the focus group interview after the conclusion of the course. The peer facilitators received no grade, had already been paid, and the course had already concluded. In addition, the focus group was recorded, transcribed, and presented to all the researchers in an effort to address the potential for participant researcher bias.

Individual interviews were conducted with randomly selected student participants. Six consenting students were individually interviewed. The researchers asked several open–ended questions designed to encourage student feedback. Based on the interviews, field notes were taken and the interviews were analyzed for content relating to the research questions.

**Data Collection and Analysis Credibility**

According to Lincoln and Guba (1985) credibility is enhanced through prolonged engagement with the subjects of interest, persistent observation, triangulation, and member checks. According to Dooley (2007), prolonged engagement, “helps the researcher to build trust, develop rapport with respondents, and to obtain a wide scope of accurate data” (p. 38). In an effort to increase credibility, the
Researchers utilized persistent observation by observing all participants, both students and peer–facilitators. Collected data was triangulated between students, peer–facilitators, and multiple researchers.

Furthermore, collected data was presented to individual student participants and peer facilitators to allow for member checks. According to Lincoln and Guba (1985), “The member check, whereby data, analytic categories, interpretations, and conclusions are tested with members of those stakeholding groups from whom the data were originally collected, is the most crucial technique for establishing credibility” (p. 314).

Transferability
In an effort to facilitate transferability, it is essential to describe the context and data in rich, vivid detail (Dooley, 2007). The context for this research was a junior level leadership course at the Ohio State University. The three credit course consisted of 33 students: 12 males and 21 females.

Prior to the beginning of the course, six upperclassmen who had previously taken the course were selected to serve as peer facilitators. A total of six facilitators were chosen based on the size of the class (33 students) and the availability of facilitator stipends. All six peer facilitators were of senior standing and female in gender. The term “peer facilitator” was chosen to avoid the stereotypical, power–laden image conveyed by the term “teaching assistant.” Peer facilitators were randomly assigned to one of six student groups. Each peer facilitator was responsible for working with five to six students.

The peer facilitation position was voluntary and supported by a stipend. Consequently, peer facilitators did not receive college credit, were not graded on their efforts, and were not bound by work study requirements. Each peer facilitator was supplied a course text and assigned the task of teaching four chapters of course content, covering a three week span of time. The course instructor allowed the peer facilitators complete freedom in determining the manner in which the content was presented, and the peer facilitators were encouraged to be creative, avoid lecturing, and utilize any teaching technique, manner or setting they felt would best convey the information.

Prior to, and during the peer facilitation process, the peer facilitators met with the course instructor. A series of four collaborative meetings allowed for the exchange of ideas relating to the development and support of course content as well as any administrative or procedural issues relating to the peer facilitation process. The course instructor rotated between peer facilitation groups, conducting participant observations, individual interviews, and member checks.

Dependability
Dependability was gained through the use of an “inquiry audit” to examine the research process and product for consistency (Lincoln & Guba, 1985). The student and peer facilitator data was coalesced into two respective documents (SR=student reflections and PFR=peer facilitator reflections) and line numbers were utilized to facilitate the inquiry audit. Unless otherwise noted, the data utilized to address research question one is contained in the SR document and data utilized to address research question two is contained in the PFR document. The inquiry audit was conducted by a third researcher who examined all data and research artifacts in an effort to ensure dependability of the results.

Patton (1990) believed the internal validity of research was enhanced through the triangulation of data. Thus, the researchers sought to provide the highest level of research credibility and meet rigorous validity standards by utilizing two of Patton’s four types of triangulation: data triangulation and triangulation through multiple analysts. Data triangulation was attained by careful analysis of student reflections, researcher observations, and peer facilitator focus group interviews. Multiple analysts were utilized to ensure data analysis by both participant observation (course instructor) and non–participant observation.

Confirmability
In qualitative research, the concept of objectivity is replaced by confirmability (Lincoln & Guba, 2000). According to Mertens (2005), confirmability is the assumption that, “data, interpretations, and outcomes are rooted in contexts and persons apart from the researcher and are not figments of the imagination. Data can be tracked to their sources, and the logic used to assemble interpretations can be made explicit in the narrative” (p. 15). All participant data were identified by line numbers and can be tracked to the original sources. Confirmability
was enhanced through the use of multiple sources of data and multiple analysts

Results/Findings

Research question one sought to identify student perceptions of the peer facilitation process. Students were asked to write a non–graded reflection of the peer facilitation process and three main themes emerged. Themes included: enhanced educational opportunities, relational benefits of peer facilitation, and student concern for the selection and roles of the peer facilitator.

Enhanced Educational Opportunities

Participants indicated the peer facilitators were able to tailor information to the individual students and became “mentors,” “a wonderful resource,” and like a “personal professor.” The peer facilitator “…was able to help bridge the gap between our group of students and our course instructor because she knew exactly the types of things he was looking for and gave us possible suggestions on how we could meet everyone’s goals” (11–14 SR). Peer facilitators were described as aiding students in “retaining much more of the information,” (534) “helping us a great deal,” (25) and having “a tremendous positive impact in helping me better understand” (214).

Participants acknowledged and commended one of the peer facilitators for her willingness to ask how the students in her group learned and then she “organized the material around the requests and suggestions” (349). One student respondent stated, “Peer facilitators are great tools to use in order to develop college students’ interest in learning” (529–530).

Peer facilitators allowed for the opportunity to include structured and guided group work leading to “many good conversations” and “very good discussions.” The peer facilitator groups “…allowed us to learn better communication with people we had to work with, like a work setting would be, forced cooperation” (679–680). A student concluded, “…it is easier to learn from my peers than from some teachers” (263–264).

Relational Benefits

Participants indicated the peer facilitators were able to build strong working relationships with students by being approachable which “made the class more comfortable.” Utilization of similarly aged peer facilitators provided a “person who could truly understand and relate to what we [students] were doing” (439–440).

The peer facilitators provided an outlet for students to “express how they really felt.” One student shared a frustration, alleviated by the peer facilitator,

I do not open up easily to professors as I see them as somewhat intimidating. I feel that it has been so long since they have been to college that they have forgotten what it feels like to be sitting in our seats (540–542).

Accessibility and timeliness of correspondence was presented as a concern by students with respect to professors. Peer facilitator usage lessened this concern with students. “I liked having someone besides the instructor who was easy to get a hold of for questions” (650–651). Voiced by a different participant “I also liked having a peer facilitator, because if I had a quick question regarding the topics or any assignments, I could just ask her (peer facilitator)” (219–220).

Students appreciated the chance to work with peer facilitators. “It was nice to be able to interact with someone more of our own age and in not as formal of a setting” (419–420). Qualities of the peer facilitators that were mentioned by students included “optimistic,” “pleasant,” “supportive,” and possessing a “friendly smile.” The working relationship built between the peer facilitators and the students transcended the walls of the classroom. “The peer facilitators had all been in our shoes at some point and could offer up not only help for the leadership class, but other classes that we were taking” (441–442).

The Selection and Roles of the Peer Facilitator

Students voiced concerns in the interviews and reflection papers pertaining to the selection of the peer facilitators and the role of the peer facilitators. Students expressed dissatisfaction with two of the six peer facilitators. This theme was consistent for all 11 students who comprised the two groups. The student concerns related to the content being taught and the interaction between certain peer facilitators and students. “The major problem with the peer facilitation, in
my opinion, was that no new content was taught during the entire time the facilitator was teaching” (116–117). One student gave some credit to the peer facilitator with reservation “…lessons that she taught were well thought out but seemed to lack content. In learning new subject matter I would rather be taught by someone with a large knowledge base of the subject area” (765–768).

Comments from other participants within the same two small groups stated that the peer facilitator “…did not exemplify the ideas of leadership we were taught in class” (82) and “was uninformative, leaving out important contact information” (70). To one student the peer facilitator appeared “…immature and not someone that I should look up to or learn from” (121).

Recommendations were presented by the students with respect to the previous concerns. “I would recommend being more selective when choosing peer facilitators for next year” (90–91). One student participant speculated about the concerns and made the following suggestions:

I found that some of them (small groups) did not have such a great relationship with their peer facilitator. Either their group did not want to get along, the members did not care to listen to someone practically their own age or the peer facilitator just did not care about the project or the group. These are all very possible problems that must be addressed if peer facilitators are to be used in the future. One suggestion might be to select only the best of the best seniors to be peer facilitators. Or even select the very best graduate students, which would allow for more of an age gap. (394–400)

The second area of concern dealt with the role of the peer facilitator. Some students were unsure as to the expected role of the peer facilitator. Either their group did not want to get along, the members did not care to listen to someone practically their own age or the peer facilitator just did not care about the project or the group. These are all very possible problems that must be addressed if peer facilitators are to be used in the future. One suggestion might be to select only the best of the best seniors to be peer facilitators. Or even select the very best graduate students, which would allow for more of an age gap. (394–400)

Research question two sought to identify peer facilitators’ perceptions of the peer facilitation process. In an effort to increase the credibility and dependability of the data and examine all participant data, a focus group interview was conducted with the peer facilitators at the conclusion of the course. Open–ended questions were asked in an effort to solicit the perceptions held by the peer facilitators. Themes emerged relating to areas of concern with the peer facilitation process, student skills developed as a result of peer facilitation, and unique contributions of the peer facilitators to the student learning process.

Overall Student Perceptions

Students in the course acknowledged the use of peer facilitators as “a great idea,” “a wonderful idea,” and innovative. “I have never been in a class where this idea was implemented, so I was interested to see how it would go” (378–379). Use of peer facilitators “provided a valuable break from the traditional classroom. It offered us [small group] a time to discuss the topics at hand in a much more casual environment. We [small group] would encourage the future use of peer facilitators” (445–446).

A majority of the students viewed the peer facilitators as beneficial and recommended future use of peer facilitators in the course. “The idea of utilizing the peer facilitator is a good one and I would recommend continuing the use of them” (386–387). Another participant echoed the aforementioned comment saying, “I would like to see this type of set up be used again in future classes because I do believe it was beneficial” (691). One student commented, “Positives of the peer facilitator definitely outweigh the negatives” (795).

Peers Facilitator Concerns

The peer facilitators identified the relational aspect as an area of concern relating to the peer facilitation process. While the relational aspect of peer facilitation appeared to be beneficial, there were concerns expressed by the peer facilitators. “It was easy to get off track because we had a lot in common. I mean we are close in age and it got hard to stay on track at times” (24–25, PFR). A follow–up question to probe into these feelings was posed asking whether the peer facilitators felt they should have some control over the grading of the course. Three
Peer facilitators felt it would have been beneficial to have some control over the grading in the course. Three peer facilitators deemed having control over the grading of the course was not necessary with one peer facilitator stating, “I wouldn’t have been comfortable giving out grades, and I don’t know that they would’ve been fair” (388–389).

The peer facilitators identified two areas of potential change in the peer facilitation process. Peer facilitators recommended increasing the contact time; however, when one peer facilitator posed the idea of increasing the contact time with the students, several peer facilitators voiced that they “…liked it the way it was.” Another recommendation from the peer facilitators was to encourage and even potentially require attendance of the peer facilitators in more class lectures taught by the instructor. One facilitator stated, “I didn’t realize how much it would have helped me to use some of the lectures that you (instructor) did” (172–173) followed by “I think seeing some of the lectures and knowing a little bit more background and information about what the students have done in class would be helpful” (180–182).

**Student Skill Development**

The peer facilitators identified several areas of skill development they observed from the students during the course of the peer facilitation process. Areas identified included: social development of introverted students, personal accountability, adaptability, communication, cooperation, networking, flexibility, and teamwork. A specific example shared by one peer facilitator included, “… one student in particular I think grew a lot in this group, and he was very quiet when we first started . . . he perked right up so I think that his social skills went up, and I thought it was really neat to watch” (253–258). Another peer facilitator summarized her thoughts by saying, “I think one of the biggest skills my group really grasped was teamwork” (298).

**Unique Contributions**

Facilitators were asked what they offered as a peer facilitator that the instructor could not. The unique contributions the peer facilitators reported they brought to the student learning process were one–on–one attention and a sense of being relatable. A peer facilitator stated:

I think as instructors grow older they may not clearly remember what it felt like to be a student struggling through college, or dealing with all these different aspects, and I think the fact that we’re going through what they’re going through right now helps. None of us have money, we’re dealing with scholarships, with grades in class, with another job, time commitments and everything they’re struggling with. So they’re seeing us doing everything on top of teaching them, so I think that’s something that they learned from us as well, where we can fit in where an instructor wouldn’t be able to. (366–373)

Another peer facilitator echoed a similar sentiment:

The students not only see us teaching in front of them and doing things with them, but they also see us in other facets of our life; winning awards, leading organizations, things like that. I think it’s very important. I don’t know if we exactly inspire them, but I’d like to think that we at least have an influence on positive behavior. (357–360)

**Peer Facilitators’ Overall Perceptions**

Peer facilitators described the experience as “liking it,” “it was fun,” and “a great opportunity…to grow and learn new teaching methods” (213). One peer facilitator stated, “I learned more as a peer facilitator than I did when I took the course” (415). When asked if the experience changed the peer facilitators in any way, the facilitators discussed how being a peer facilitator provided them an opportunity to sharpen their teaching skills and develop a deeper understanding of balancing formal and informal instruction.

**Conclusions/Recommendations**

Students appear to appreciate the enhanced educational opportunities afforded by the peer facilitation experience. The participants indicated that the peer facilitation process allowed for a break from the traditional lecture and provided an interactive environment which
aided in student learning. Students indicated the peer facilitators presented information in a unique manner which served to increase student communication and cooperation.

The theories of both Vygotsky and Piaget support the ability of peers to structure information in a relevant manner. Vygotsky (1978) believed that peers were better able to structure information because of their familiarity and understanding of peers’ misconceptions, and Piaget believed that the disequilibrium, resulting from the contrasting viewpoints of other peers, would equilibrate based on further peer interaction (De Lisi & Golbeck, 1999; Piaget, 1965, 1985). The results of this research support the cognitive benefits associated with peer interaction.

Two of the major themes that emerged from the data displayed the participant’s thoughts relating to the learning process (educational enhancement) and feelings relating to peer facilitation (relational benefits). De Lisi (2002) recognized the importance of both thoughts and feelings and stated that, “Thoughts are important because they delimit the child’s capability in a given situation. Feelings are important because they provide the motive force for thinking and acting” (p. 9). The peer facilitation process allowed students to engage with each other and course content in a manner which stimulated both cognitive and affective domains.

De Lisi (2002) recognized that peer–to–peer interaction may result in dysfunctional interaction. This is clearly seen in the comment of one of the participants who stated, “During our class time with our peer facilitator, I felt like I was being treated like someone in high school or younger” (43–44 SR). Instead of directing limited cognitive resources towards academic content, the student invested precious resources in the analysis of interaction. Further research should examine the degree to which students devote cognitive learning resources to analyze the interaction as opposed to the learning.

Based on the results of this research, students found the contributions of two of the peer facilitators to be substandard. This result is not surprising considering the difficulty associated with engaging in peer facilitation. De Lisi (2002) discussed the ability of peers to provide competent instruction and stated, “The ability to provide help of this nature requires very sophisticated social skills and metacognitive awareness” (p. 335). An analysis of the application documents of the two substandard peer facilitators revealed that both had less previous opportunity to interact in peer–type learning situations. Presumably, peer facilitators in question may have had difficulty employing sophisticated social skills and metacognitive awareness. During the duration of the study, it became quite apparent to the researchers through observation, conversations, and interviews that two of the peer facilitators struggled in meeting the relational, educational, and affective needs of the students.

The implementation of new teaching techniques requires careful planning and a wholehearted commitment to reflective practice; however, it is imperative for the classroom teacher to carefully construct the peer learning environment (Woolfolk–Hoy & Tschannen–Moran, 1999). While the intent of this research was not to provide a detailed methodology for the implementation of peer learning, further insight into the successful procedural development of classroom structures can be found in Woolfolk–Hoy and Tschannen–Moran (1999).

The participants in this research, emphasizing the relational and educational benefits, supported the continuation of peer facilitation, yet encouraged purposeful attention to administrative and procedural details. Careful attention to the selection of peer facilitators will assist in maximizing the potential benefits of the peer facilitation process. Research should be conducted to determine applicable criteria for selecting effective peer facilitators. Further research should be conducted to examine and measure the specific cognitive and affective gains associated with peer facilitation. In addition, an analysis of current research regarding ways to increase the efficiency and effectiveness of peer learning structures is warranted.
References


JONATHAN J. VELEZ is an Assistant Professor of Agricultural Education in the Department of Agricultural Education and General Agriculture at Oregon State University, 112 Strand Agricultural Hall, Corvallis, OR, 97331. Email: jonathan.velez@oregonstate.edu

JON C. SIMONSEN is an Assistant Professor of Agricultural Education in the Department of Agricultural Education at the University of Missouri, 125A Gentry Hall, Columbia, MO, 65211. Email: simonsenj@missouri.edu

JAMIE CANO is an Associate Professor in the Department of Human and Community Resource Development at The Ohio State University, 208 Agricultural Administration Building, Columbus, OH, 43210. Email: cano.1@osu.edu

JAMES J. CONNORS is an Associate Professor and Department Chair of Agricultural & Extension Education in the Department of Agricultural & Extension Education at the University of Idaho, 1134 West 6th Street, Moscow, ID, 83844-2040. Email: jconnors@uidaho.edu
Implementation of Supervised Agricultural Experience Programs: The agriculture teachers’ perspective

Michael S. Retallick, Assistant Professor
Iowa State University

The purpose of this qualitative exploratory study was to examine how agriculture teachers implement supervised agricultural experience (SAE). A combination of focus groups and individual telephone interviews were conducted. Iowa agriculture teachers offered SAE because it is (a) a means of developing life skills, (b) a component of the FFA award system, and (c) theoretically, one-third of the agricultural education model. Although agriculture teachers were able to talk conceptually and theoretically about the benefits and value of SAE, they did not necessarily practice SAE in that manner. The method in which teachers implemented SAE programs varied considerably as did the means by which they conducted their SAE programs. Five factors were identified that limited SAE: (a) changing demographics and societal attitudes, (b) mechanics and structure of schools, (c) resource availability, (d) image, and (e) the agricultural education system. These findings would indicate that there is dissonance between (a) theory and practice, and (b) experience and learning of SAE. It is recommended that the purpose of SAE be further refined, communication regarding the value of SAE be increased among the stakeholders, creative and innovated approaches to SAE be explored, and the complete experiential learning model be incorporated into SAE programming.

Keywords: supervised agricultural experience, experiential learning, agriculture teachers, secondary education, school-based agricultural education

Introduction and Review of Literature

Supervised Agricultural Experience (SAE) is defined as “the application of the concepts and principles learned in the agricultural education classroom in planned, real–life settings under the supervision of the agriculture teacher” (Talbert, Vaughn, Croom, & Lee, 2007, p. 418) and provides educational value by connecting theory and concepts offered in the agricultural classroom in an understandable context (Phipps, Osborne, Dyer, & Ball, 2008). It most likely evolved from the apprenticeship model utilized in Colonial America and today, as a result of either tradition or a philosophical tenet of the agricultural profession, is espoused as one of the three integral components of agricultural education (Croom, 2008). While there may be some difference of opinion as to who first conceptualized the idea of the project method (Roberts & Harlin, 2007), Rufus Stimson is credited as the father of SAE when he created the concept of the home project in the early nineteen hundreds, which serves as the precursor to today’s SAE (Croom, 2008; Phipps et al., 2008; Roberts & Harlin, 2007).

The Handbook for Agricultural Education in the Public Schools (Phipps et al., 2008), Methods of Teaching Agriculture (Newcomb, McCracken, Warnbrod, & Whittington, 2004), and Foundations of Agricultural Education (Talbert et al., 2007) serve as the primary texts for the professional development of school–based agricultural teachers. All three texts describe SAE as an integral, intra–curricular component of agricultural education and each establishes the rationale for and value of SAE. These texts as well as research findings have identified the benefits and issues of SAE.

Talbert et al. (2007) indicated that students realize several benefits from SAE participation including:
development of decision-making skills, including career and personal choices, improved self-confidence and human relation skills, application of knowledge learned in the classroom, knowledge of a variety of occupations and careers, development of time management and record-keeping skills, document of experience needed on job applications, discovery of areas of personal interest, practice of responsibility and development of independence, and development of pride through personal accomplishment. (p. 420–421)

In addition, SAE provides a form of individualized instruction that develops the individual (Hughes & Barrick, 1993), promotes learning, and increases the self-confidence of students (Phipps et al., 2008) in a context that allows skill development and the transfer of knowledge (Dailey, Conroy, & Tolbert, 2001; Stewart & Birkenholtz, 1991).

Academic achievement is an area of contention (Newcomb et al., 2004; Talbert et al., 2007). Ramsey and Edwards (2004) surmised that SAE is an informal learning opportunity that could be used to increase science achievement. Several researchers reported a positive relationship between SAE participation and student achievement (Arrington & Cheek, 1990; Cheek, Arrington, Carter, & Randell, 1994; Noxel & Cheek, 1988), and yet, other researchers have not been able to link SAE to academic achievement (Randell, Arrington, & Cheek, 1993; Tylke & Arrington, 1988).

A fundamental issue of SAE is that teachers understand the value and importance of SAE, but often their actions do not extend beyond rhetoric (Wilson & Moore, 2007). Teachers often believe SAE is inappropriate for their individual situation (Camp, Clarke, & Fallon, 2000) and regularly identify barriers limiting its effectiveness. These barriers include limited time, number of students in the program, lack of summer employment, lack of support from school administration and community, complicatedness of recordkeeping, limited availability of resources, and lack of familiarity with newer SAE categories (Wilson & Moore, 2007). Additionally, the degree to which SAE is incorporated is highly dependent upon agricultural education teachers’ attitudes and expectations (Clark & Scanlon, 1996; Dyer & Osborne, 1995; Warren & Flowers, 1993) and the lack of positive communication among teachers, parents, administrators, and employers (Barrick, Hughes, & Baker, 1991; Dyer & Williams, 1997).

SAE has also had an influence on agricultural education enrollment and the economy. Research among enrollment, FFA membership, and SAE participation has suggested positive relationships between FFA membership and SAE participation (Retallick & Martin, 2008; Talbert & Balschweid, 2004; Thompson & Shumacher, 1998; White & Pals, 2004). Research also suggested a positive economic impact resulting from SAE (Graham & Birkenholz, 1999; Retallick & Martin, 2005; West & Iverson, 1999), including a positive return on investment (Retallick & Martin, 2005).

Because of these findings and the related issues, many researchers have concluded that there is a perceived need to expand the concept and scope of SAE to meet the requirements of a more diverse clientele (Barrick et al., 1991; Graham & Birkenholz, 1999; Retallick & Martin, 2008; Roberts & Harlin, 2007; Steele, 1997; Wilson & Moore, 2007). Others have also identified a need for more in-service and dialogue related to the issues associated with SAE (Dyer & Osborne, 1995; Graham & Birkenholz; Ramsey & Edwards, 2004; Wilson & Moore, 2007). Furthermore, Dyer and Osborne (1996) reported finding no guidelines as to how program quality was measured and/or evaluated and admitted that, at the time of their study, no empirical research had been conducted to suggest that SAE is educationally beneficial.

In summary, agricultural education texts and agriculture teachers espouse the importance of individualized SAE programs as part of a comprehensive agricultural education experience. However, Retallick and Martin (2008) found that fewer agricultural education students participated in SAE and questioned why agriculture teachers fail to fully integrate the SAE portion into their agricultural education program.

**Theoretical Framework**

The process associated with SAE is widely accepted and is closely related to experiential learning (Camp et al., 2000; Dyer & Osborne,
The National Society of Experiential Education defined experiential learning as those learning activities that involve the learner in the process of active engagement with, and critical reflection about, the phenomena being studied (Sweitzer & King, 2009). Experiential learning is a “framework for examining and strengthening the critical linkages among education, work, and personal development” (Kolb, 1984, p. 4) and can be characterized as both a process and context (Roberts, 2006). In synthesizing experiential learning theory, Knobloch (2003) identified the four tenets of experiential learning as learning by doing, learning through real-life contexts, learning through projects, and learning through problem-solving.

Experiential learning theory evolved from the work of Dewey (1944) who espoused an inextricable linkage between knowledge and experience and argued for a more educative experience. Lewin (1947) expanded on Dewey’s thoughts and theorized that individuals set goals, theorize about prior experience, experiment with that theory, and then revise goals and theories. Kolb (1984) provided a structure for the experiential learning process, which consisted of a four-stage cycle including concrete experience, reflective observation, abstract conceptualization, and active experimentation. Beard and Wilson (2002) further explained that the combination of ingredients within the experience (i.e., external environment, sensors, and internal environment) is what maximizes the power of the experience and, in turn, maximizes learning.

Using the experiential learning theory, Phipps et al. (2008) offered a cyclical experiential learning model specifically for SAE. The four components of the model are experience, reflection, explanation, and evaluation. The initial experience provides the basis for reflection causing explanation (or clarification) of the experience. Finally, the student evaluates whether re-experience is needed or if it is appropriate to move to additional experiences. The cycle is then repeated. The cyclical experiential learning model provides the theoretical framework for this study.

Purpose and Objectives

The purpose of this exploratory research study was to examine how agricultural teachers implement SAE into their agricultural education program. The following objectives guided the study: (a) explore the reason why agriculture teachers may or may be using SAE in their local agricultural education program, (b) determine how teachers implement SAE in their programs, (c) identify factors limiting SAE, and (d) identify ways in which to improve SAE.

Methods and Procedures

A basic interpretive qualitative study was designed to collect and inductively analyze the data (Merriam, 2002) and was framed in a post-positivist epistemological perspective (Gall, Borg, & Gall, 1996). Researcher bias is an issue in qualitative research (Ary, Jacobs, & Razavieh, 2002). As such, it should be noted that the researcher has taught and incorporated SAE into agricultural education at the secondary level. Currently, the researcher is an agricultural teacher educator who has taught post-secondary students about the comprehensive agricultural education model and published other research on SAE.

A mixed methods approach was used to accomplish the purpose and objectives of this study. Focus groups and individual phone interviews were conducted and a survey instrument was developed to collect demographic information on each of the participants. The focus groups were conducted during the State Agricultural Teachers Summer Conference. The individual phone interviews were conducted following the conference.

In an effort to increase transferability, procedures and materials for the focus groups and interviews were developed and conducted by the researcher following the protocol established by Krueger and Casey (2000). A written plan was developed and a list of semi-structured, guiding questions were used to help maintain flow and consistency among focus groups and individuals during the phone interviews. In addition to the guiding questions, a script that included a welcome, an overview of the topic, ground rules, and a list of questions, was developed. Both approaches were reviewed...
and human subjects approval was provided by the Institutional Review Board of the university.

Three one-hour focus groups were scheduled during the Iowa Agricultural Teachers Summer Conference. An announcement was made during the opening session of the conference. Those interested in participating were asked to sign up at the registration desk. Participation was limited to the first eight people to sign up for each focus group time. At the time of sign up, participants were given a copy of the informed consent. A signed copy of the consent form was collected prior to the start of the focus group. An undergraduate research assistant served as moderator while the researcher served as an assistant to the moderator and took field notes.

The use of self-selected focus groups and the topic itself may introduce bias. First, participants may have self-selected to participate, perhaps, due to a strong personal interest in the topic. That interest may have been one in which the participant was strongly in favor of SAE or very frustrated and struggling to implement SAE. Second, the responses to the focus group questions might have been normed to the context; meaning that the participants may have reported that the topic is important and valued because it is continually espoused as such by the profession.

Focus group participants were asked to complete a short, nine-question survey to obtain general demographic information. The questionnaire was developed according to Dillman (2007). Four former school-based agricultural instructors reviewed the instrument for content and face validity. Focus group participants completed the instrument at the beginning of the focus group session.

An undergraduate research assistant conducted telephone interviews with individual agricultural educators. The Iowa Department of Education Agricultural Educator Directory was used to identify and contact the participants. All secondary agricultural educators except for those who participated in the focus groups were eligible to participate. Participants were randomly selected. Telephone calls were made until ten agricultural educators had been contacted and interviews were conducted.

A two-step process was followed for the phone interviews. First, an initial phone call was made to each participant at which time the purpose of the phone call was explained and a mutually acceptable time was scheduled to conduct the interview if the participant was willing to participate. Second, the phone interview was conducted. At the beginning of the scheduled interview, an informed consent script was read and a verbal consent was obtained. The interview was conducted using guiding questions. At the conclusion of the interview, demographic information was collected using the questionnaire and the participant was thanked for his/her time.

Data analysis was conducted using transcripts of the focus group interviews, field notes, and member checks (Krueger & Casey, 2000). The researcher and two undergraduate research assistants conducted the interviews, reviewed transcripts, and studied field notes using an interactive process to identify the common themes (Dooley, 2007; Krueger & Casey, 2000). Analyst triangulation was used to ensure validity and trustworthiness (Patton, 1990). The combination of focus groups and individual interviews, analysis comparison among the researcher and research assistants, and member checks provided triangulation. All materials were coded to ensure confidentiality.

Findings

A total of 34 agricultural teachers (24 focus group participants and 10 individual telephone interviewees) participated in this study. Years of teaching experience ranged from 1 to 35 years with a mean of 17 years. All participants taught in single teacher programs and all had an extended contract that ranged from 10 to 60 days with a mean of 43 days. Thirty of the 34 participants (88%) reported incorporating SAE into their local agricultural education program. When agriculture teachers were asked to describe their SAE program, there was a wide range of responses from the very traditional, such as crop and livestock enterprises, collecting scrap metal, mowing lawns, and working in grocery stores, to the more creative, including agriscience research, farmer’s markets where fruits and vegetables were marketed, as well as horticultural, floricultural, and avian-related businesses.

The first objective was to explore why agricultural teachers may or may not be incorporating SAE into their local programs. For
those teachers who were using SAE, their responses were categorized into three areas. The primary reason for using SAE was the development of life skills. Teachers reported using SAE to teach record-keeping, record analysis, financial management, and money management as a means to enhance decision-making and employment skills while developing skills related to student responsibility. For example, one teacher stated, “the longer I teach, the more I see the value of it ...they’re not being taught these life skills anywhere else in our school.”

The second reason for teaching SAE was the FFA award system. Teachers required students to develop a SAE portfolio for FFA degree advancement and proficiency awards. They incorporated SAE because it was a requirement for FFA degree and award applications. As one teacher suggested, “degree advancement in FFA, proficiency awards in FFA are great portfolios where you can document skill development and ability to perform on certain levels” using SAE.

The third reason teachers mentioned for incorporating SAE into their agricultural programs was because it is part of the tripartite mission of a comprehensive agricultural education program. Many teachers believed in the agricultural education model represented by the Venn diagram (Figure 1) and claimed that the SAE component is what makes agricultural education unique and valuable at the secondary level. Several teachers stated that without SAE, one-third of agricultural instruction and our identity is missing. For example, many teachers agreed with this teacher’s statement. “One of the main keys to the existence of Ag Ed...if we give up our SAEs and FFA, what is the difference between our program and any other program in the public school system?”

Figure 1. Venn diagram representing the agricultural education program.

Agriculture teachers also reported a variety of benefits for conducting SAE programming. They appreciated the community support and positive public relations that developed from involvement in SAE. Teachers also valued the opportunity for relationship building among agriculture teachers, students, parents, school administrations, employers, and the community as a whole. As one teacher explained, “I think for me, it’s built some community support. You get out and you meet parents and you meet business owners and employers. It just makes you kind of feel you know people if something comes up, you know who to talk to or you know someone who can provide the information.” Teachers believed that SAE goes beyond the concept of an internship by helping to extend the classroom beyond the school campus. Students are able to apply course material outside the classroom as well as bring outside experiences back into the classroom.

The second objective of this study was to determine how teachers implemented their SAE programs. Interestingly, there was a wide range
of responses, which prevented a common theme from emerging. Some teachers required SAE of all students enrolled in agricultural education courses; others required record books of their FFA members while others made it optional, and a few teachers did not use SAE in their agricultural education program. Some teachers incorporated SAE into their programs beginning with an introduction to SAE in their freshmen–level courses and then regularly updated record books thereafter. Other teachers sporadically used regular class time, often at the end of a grading term, to update record books. Yet other teachers either required students to update record books outside of class or used it as “homework.”

The teachers’ approach to how they implemented SAE seemed to be influenced by whether or not SAE was part of a student’s grade and how SAE was graded. Some teachers made SAE part of the course grade and graded the SAE based upon the completeness and the extent to which it was up–to–date. Others used SAE as the midterm and/or final exam for the class and still others used SAE as extra credit or as a means for helping the student improve their class grade.

The third objective of this study was to identify factors limiting SAE. Agriculture teacher responses were distilled into five categories: (a) changing demographics and societal attitudes, (b) mechanics and structure of schools, (c) resource availability, (d) the agricultural education system and (e) image. For those teachers who didn’t utilize SAE, these issues outweighed the benefit and their perceived value of SAE.

The changing demographics and societal attitudes seemed to be the largest struggle for teachers. Teachers commented on the extent to which the agricultural classroom is becoming more diverse including but not limited to gender, ethnicity, socio–economic status, and academic ability. Teachers mentioned that the academic backgrounds and personal experiences of students ranged considerably and suggested that often their students lacked a work ethic and were not accustomed to putting in “sweat equity;” most students looked for instant gratification or the easy way out, which does not fit the SAE model. Teachers also believed that family demographics and the support systems have changed to a point where single parent families and the lack of a family nucleus have impacted SAE opportunities. Teachers believe society has become too protective of students stating “young kids are not taught how to handle adversity of any kind…we protect them from failure or anything harmful.”

From a societal perspective, agriculture teachers believed that the importance and purpose of student work experience has evolved from one of exploration, learning, and skill development to one of necessity to cover costs of automobiles, gas, cellular phones, etc. Teachers also noticed parents and administrators encouraging students to focus more on college preparation rather than career preparation, while other parents view the student’s “job” as that of a student. Parental protectionism also seemed to be an issue for agriculture teachers. Students are intimidated by and lack the patience to participate in SAE because parents have not allowed students to face adversity – “to be allowed to fail, manage stress and conflict, or deal with things outside their control.”

The mechanics and structure of schools today also impact SAE. Continuity of course offerings has influenced SAE participation. Agriculture teachers reported having fewer students complete their agricultural education program because the curriculum has been changed to make for easier entry and exit. As one teacher stated, a “frustration I run into with SAE is the students who I might have as a freshmen, but can’t get back into classes until their sophomore year and they kind of get left behind.” The school day structure also influences the continuity, according to the agriculture teachers. School structures could range from semester, trimester, quarter, or year–long courses and the school day schedules could range from various types of modified block schedules to the traditional seven–, eight–, or nine–period day.

Teachers also stated that administrative support in the form of travel funding, extended contracts, and visit periods is an issue because of the administrators’ lack of understanding of the comprehensive nature of agricultural education programs. Focus on state and federal mandates as well as credible and verifiable accountability has affected SAE. For example, “our school is really pushing for all teachers to incorporate reading and writing into their classrooms, so I spend absolutely no time on SAE record books
during the classroom period because instead, I’ve incorporated reading different books related to every class.” A final issue raised by the teachers is that high school teachers are now offering their upper level courses for community college credit, which requires the teacher to teach the college content, leaving no time for activities like SAE. “I can’t do SAE record books in the class and meet the community college requirements,” stated one teacher.

Agricultural teachers mentioned that the lack of resources, for both students and teachers, is an issue for SAE. First, the teachers reported that students no longer have the physical and financial resources and opportunities of former generations of students, requiring more creativity and ingenuity on behalf of the student and teacher. Outside the traditional SAEs, “students lack opportunities in their immediate area and, in many cases, are forced to drive 25 or more miles to a radio station or newspaper to have an SAE experience in agricultural communications,” for example. Agriculture teachers stated that resources are an issue. With increasing enrollments and a more diverse student body, the time commitment required of individualized instruction is an issue, as is the level of creativity and effort required to identify and supervise individualized SAE opportunities.

Teachers also believed that the agricultural education system caused issues with SAE. Both the award system as well as the approved SAEs for FFA awards do not necessarily fit today’s students. Teachers suggested that there does not seem to be a focused purpose or list of articulated expectations related to SAE and, as a result, SAE varies considerably from teacher to teacher. “There is no consistency among the requirements, expectations, or programs related to SAE,” stated one teacher. Finally, teachers suggested that the image of SAE is an issue. As one teacher put it, “SAE is the interworkings, the engine that makes Ag Ed work, but not as glamorous as FFA or classes.” The school administration, parents, and community view the teachers as FFA and agriscience teachers, but not as SAE teachers. The other issue related to image is the stereotype that agricultural education is only about production and “vocational” agriculture.

The final objective of the study was to list teachers’ suggestions for improving SAE. Teachers’ suggestions could be summarized by stating that there is a need to redefine SAE and educate stakeholders about SAE so that there are consistent messages and expectations. They stated that SAE needs a structure that can work in a variety of educational settings and with a diverse group of students, allowing more exposure to nontraditional opportunities like entrepreneurial innovation and research. With that said, teachers acknowledged that SAE cannot be one size fits all, but stressed that the structure and purpose of SAE must be consistent across the state and nation. They believed that such an approach would provide a clearer message to stakeholders. Teachers also recommended an increased focus on career exploration and the expansion of the linkage among “what students do every day, what they learn in class, and what they really know.”

Although communication was an important component to teachers, they identified it as an area of improvement. SAE should be promoted because it addresses the three R’s (rigor, relevance, and relationships) as well as any school curriculum or program. They envisioned the value of SAE being articulated so that students seek agriculture teachers wanting an SAE experience rather than forcing students to participate and creating resistance. They suggested educating the public and school administrators and increasing communication with guidance counselors because their perception of agriculture generally hasn’t evolved with the industry or agricultural education curriculum and it’s difficult to “educate parents who have not been in FFA.”

Conclusions, Recommendations, and Implications

This study helps to identify the factors that affect SAE participation (Dyer & Osborne, 1995). Agriculture teachers stated that they offered SAE because it is (a) a means of developing life skills (i.e., record-keeping and employability skills), (b) a component of the FFA award system, and (c) theoretically, serves as one-third of the agricultural education model. However, the findings of this study would indicate that teachers do not practice SAE as it was conceptualized; they talk about SAE conceptually but do not practice it, which is consistent with Dyer and Osborne (1995) and Wilson and Moore (2007).
The means by which agriculture teachers in this state conducted their SAE programs were very inconsistent and varied in how they were implemented. Five factors evolved that limited SAE programming. These limiting factors were (a) changing demographics and societal attitudes, (b) mechanics and structure of schools, (c) resource availability, (d) image, and (e) agricultural education system. These finding are consistent with the findings of Dyer and Osborne (1995), Graham and Birkenholz (1999), Retallick and Martin (2005), Roberts and Harlin (2007), Steele (1997), and Wilson and Moore (2007). Others have also identified a need for more in-service and dialogue related to the issues associated with SAE (Ramsey & Edwards, 2004; Wilson & Moore, 2007).

Although many of these findings are consistent with previous SAE research and the espoused purpose of SAE, these findings suggest that there are two areas of dissonance within SAE. First, the results of this study suggest a discord between theory and practice. Agriculture teachers believe in the agricultural education model and can articulate the benefits of SAE, but find it difficult to implement in practice. There seems to be a lack of consistency as to how and to what extent SAE is incorporated as part of a comprehensive agricultural education program.

The concept of SAE has evolved since its inception, but it has not kept pace with the changing dynamics of the classroom and the student body. Teachers struggle to incorporate the traditional SAE approach with a more diverse classroom under various types of school structures with fewer resources – all the while facing an increased level of accountability.

It is recommended that SAE be reviewed to further refine its purpose and determine how to fully implement that purpose given the issues classroom teachers face. Questions to consider might include the following: Is SAE still a vital component in agricultural education instruction? Is SAE viable given the issues teachers face? Should SAE serve only as an application of learning and an extension of the classroom as suggested by Newcomb et al. (2004)? How can the context of SAE and the FFA award system fit as part of a comprehensive educational program?

No matter what changes occur related to SAE, communication with all stakeholders is critical for success, especially those outside the agricultural education profession. Advertising and promotional campaigns, including public service announcements, would help communicate the purpose and value of SAE, increasing stakeholder support and student interest.

It is also recommended that creative and innovative approaches to SAE be encouraged and disseminated to agricultural teachers for implementation into their diverse settings. Examples of such approaches might include short–term, group–based projects; student–owned and –managed cooperatives; agricultural exploratory programs; novel entrepreneurial activities; and various types of agricultural research.

Second, there seems to be a dissonance related to learning and experience. Although today’s SAE does not only include skill development and proficiency, but also personal and career development that may extend beyond agriculture (Roberts & Harlin, 2007), agriculture teachers seem to primarily focus on record–keeping and exposure to real–world experiences. Their discussion and focus suggests that their SAE, or lack thereof, does not incorporate the fundamental principles of learning, especially the experiential learning principles that are considered to be the underpinnings of SAE. Few teachers mentioned anything about the development of agricultural skills and only one stressed the value of the learning experience and the role SAE plays in developing life–long learning skills. The focus of SAE was primarily on a “job” for the purpose of completing a record book and lacked a focused learning outcome.

Because SAE is considered an experiential learning component of agricultural education, which expands the classroom, links theory and classroom content to a real–world context (Barrick et al., 1991; Dailey et al., 2001; Talbert et al., 2007), and serves as interest approaches for instruction (Newcomb et al., 2004), it is recommended that the implementation of experiential learning principles be further incorporated into SAE. SAE must be more than experience; it must also include reflection, explanation, and evaluation (Phipps et al., 2008). The results of this study suggest the focus is solely on the experience.
To move beyond the dissonance between (a) theory and practice and (b) learning and experience, it is recommended that teacher education programs and teacher in-service programming go beyond the theoretical purpose of SAE and expose teachers to a variety of proven experiential learning approaches for incorporating SAE into a variety of educational settings, especially those setting that limit participation. Teacher education programs should work closely with preservice teachers to assist them in melding theory into practice as it relates to SAE. If teachers believe it is important, they are more likely to implement SAE if they are aware of efficient and effective ways of addressing the issues that prevent them from participating (Myers, 2002).

References


MICHAEL S. RETALLICK is an Assistant Professor of Agricultural Education in the Department of Agricultural Education and Studies at Iowa State University, 206 Curtiss Hall, Ames, IA 50011, msr@iastate.edu

This paper is a product of the Iowa Agriculture and Home Economics Experiment Station, Ames, Iowa. Project No. 3613 and sponsored by the Hatch Act and State of Iowa.

Roger D. Hanagriff, Associate Professor
Texas A&M University, Kingsville
Tim H. Murphy, Professor
Texas A&M University
T. Grady Roberts, Associate Professor
University of Florida
Gary E. Briers, Professor
James R. Lindner, Professor
Texas A&M University

Experiential learning, commonly called supervised agricultural experience (SAE), is a well documented, valuable, and integral part of agricultural education (Bryant, 2003; Cheek, Arrington, Carter, & Randall, 1994; Deyoe, 1953; Dyer & Osborne, 1996; Moore, 1988; Roberts & Harlin, 2007). Measuring the cost and economic benefits of SAEs would provide valuable information in communicating additional benefits of SAE programs (Cole and Connell, 1993). Results from the study presented here found that Texas entrepreneurship SAEs contributed $103 million in direct spending to the Texas economy during the 2007–2008 school year. A common measure of economic impacts is the IMPLAN Model, which provides estimates of additional economic benefits from direct spending. When the IMPLAN Model was applied to direct spending of $103 million, results indicated $189 million in total economic value from SAE related spending. The 189 million dollar economic impact is an important value and should be communicated to school stakeholders. Methods of assessment should be improved to provide more accurate estimates of value.

Keywords: supervised agricultural experiences, economic value, sae, student experiential learning, value of agriculture education

Introduction

Previous research has linked the educational value of Supervised Agricultural Experience (SAE) to student achievement and knowledge (Cheek, Arrington, Carter, & Randall 1994; Dyer & Osborne, 1996). The educational purposes and objectives built into the SAE benefit students by challenging them to gain new skills and experiences (Bryant, 2003). SAE requires investment cost such as travel and for an entrepreneurship SAE costs for supplies and capital purchases. This research reviews the educational intent and value of SAEs along with previously completed research in measuring the economic value of agriculture education. This research also produces the first measure of the economic value of SAEs in Texas, which defines SAE’s economic value Texas receives for students’ involved in agriculture education.

Review of Literature

Experiential learning has been an integral component of agricultural education since passage of the Smith–Hughes Act in 1917, which required students to have a supervised farm project (Moore, 2003). The act required
that farm projects be an integral part of all agricultural education programs (Deyoe, 1953; Moore, 1988). Over time, the terminology of these projects evolved from supervised farm projects to Supervised Occupational Experience (SOE), to Supervised Agricultural Experience (SAE). Although historically narrow in focus, projects have been a central component of secondary agricultural education for almost 100 years. The current view on projects was broadened and modernized when The Committee on Agricultural Education in Secondary Schools released a report in 1988, often called the *Green Book*, in which the committee recommended that “emphasis should be placed on the experience and entrepreneurship, not only on the occupation” (p. 41).

The educational value of SAE has long been documented in agricultural education literature (Roberts & Harlin, 2007). Over time, “the purposes of projects in agricultural education have expanded beyond skill acquisition and proficiency to include personal development for diverse career preparation beyond agriculture” (Roberts & Harlin, 2007, p. 53). Although many types of projects are embraced, projects that focus on entrepreneurship have been central to agricultural education. Roberts (2006), for example, in his examination of experiential learning theory pointed to a statement made by Stimson (1919), which identified potential value of entrepreneurship SAEs. Stimson wrote that

Neither skill nor business ability can be learned from books alone, nor merely from observation of the work and management of others. Both require active participation, during the learning period, in productive farming operations of real economic or commercial importance. (p. 32)

Newcomb, McCracken, Warmbrod, and Whittington (2004) noted that SAEs allow students to apply practices and principles learned in the classroom and develop new skills and abilities while being involved in these projects. Likewise, Newcomb et al. (2004) concluded that supervised experiences also improve learning, student personal development, and occupational development. Case and Stewart (1985) indicated that students with both ownership and placement SAE projects came from schools with stronger programs. In other words, strong SAE student involvement is linked to strong programs.

Extensive evidence of the educational value of SAE exists in the literature; however, the value of SAEs from an economic standpoint is less understood. Borg (as cited in Cole & Connell, 1993), at the Western Region of the American Association for Agricultural Education (AAAE) meeting presented that a study focusing on SAE related spending would meet the objectives of an impact study. Cole and Connell (1993) found that studies were completed in the Region on leadership and advancement of educational progress, but none related to economic assessment even though it was identified in 1985 as one of the areas for research.

In 1993, Cole and Connell completed a study to measure the economic impact of Oregon agriculture science and technology programs by examining teacher salaries and money earned and spent by students. They found the average program value from teacher salaries was $45,920 with an additional average value from student project spending of $97,843. In Oregon, these two values combine for a total value of $143,763, which is a total economic impact of value of $245,022. Cole and Connell recommended conducting additional research using Cost/Benefit analysis to compare the cost associated with the educational program to economic benefits from the program. They also recommended that teachers collect this type of data and place it in a form suitable to report to school administration.

Christiansen (1999), in a critique of a Georgia SAE, indicated that it is timely to research economic values in today’s depressed times of lower funding. West and Iverson (1999) evaluated 174 agricultural education programs and determined that the local economic impact per SAE program in Georgia was $71,344. Additionally, they extrapolated an overall economic impact of more than $12 million to the State of Georgia.

In Missouri, data were collected from 1988 to 1997 to analyze the change in student labor income over the ten year period (Graham & Birkenholz, 1999). Total SAE labor income had increased approximately $16.1 million over the period of the study. In the final year of the study, 1997, agricultural education students in
Missouri reported a total SAE labor income of $31.8 million (Graham & Birkenholz, 1999).

Retallick and Martin (2005) published the results of a study (1991–2001) to identify the economic impact of placement SAEs in Iowa. Comparable to the Missouri study, the Iowa study focused on earned student SAE Placement income. In 2001, the Iowa study accounted for a total of $18.6 million in earned SAE income with an average annual total program with students earning $75,266.

A method to measure economic value is the Impact Analysis for Planning (IMPLAN), an input–output database and modeling system that producers multiplier values from economic models to estimate the economic impacts of spending on a region’s economy (Mulkey and Hodges, 2003). This model was created in 1993 from a University of Minnesota research team that originally used the model to measure the economic impact of the forestry industry, but now is a product of MIG, Inc. This model is used in many sectors to measure the value of expenditures and their extended value as the expenses ripple through the economy causing other increases in spending. There are many levels of IMPLAN economic impact. According to Mulkey and Hodges (2003), Type II economic value is a commonly used estimate that includes values of consumable spending, salaries and use of raw materials used in manufacturing.

Blackwell, Cobb, and Weinberg (2002) identified that research in higher education as sources of economic growth are emerging. They used IMPLAN in their research and encouraged additional research. Arik and Penn (2007) measured the economic impact of Middle Tennessee State University and identified that the direct effect consists of the initial change in expenditures. The indirect effect is the sum of the round–by–round increases in business spending for inputs. Also, the University of New Mexico concluded that IMPLAN is a widely used tool for measuring expenditure impacts to the local economy and used the model in their measurement of economic value (Norton, 2004).

The available research illustrates a variety of approaches to determine the economic value of agricultural education programs. Previous studies have utilized a theoretical framework of using Placement SAE income or teacher salary as values, but a new framework would be to consider the costs of entrepreneurship SAEs since they are an educational focus and have common types across all chapters. This theoretical framework also addresses the recommendations of Cole and Connell (1993), who suggested a Cost/Benefit approach to measuring programmatic value.

**Purpose**

The purpose of this study was to address the recommendations of Cole and Connell (1993) and determine the economic benefit of SAE programs. Economic benefits were calculated following the IMPLAN Model for economic value, which is a set of multiplier values derived from spending within certain sectors. This model is utilized in business, education and tourism by identifying economic benefits from spending money in a certain sector. IMPLAN economic benefits have several levels of multipliers, but the most comprehensive and conservative is the Type II multiplier value. The economic values of student spending to complete entrepreneurship SAE projects are $1.80 and additional travel values associated to SAEs are $2.09. Economic values of agricultural education need to be communicated to school administration, state leaders, and potential funding sources that support agricultural education. Specific objectives of the study were:

1. Define the common types of entrepreneurship SAE projects and associated investment cost.
2. Define other expenses of agriculture education programs such as travel costs for SAE exhibits and FFA events.
3. Develop the average cost for a program’s SAE projects.
4. Estimate the total investment value for all SAE projects and travel cost in Texas, and their associated economic impact.
5. Determine the total economic impact per student in agricultural education and FFA.

**Methodology**

Data were collected by developing an instrument in Survey Monkey, a web–based tool that assists in developing an online survey and
manages email distribution lists. A survey instrument was developed that included demographic information and a list of common entrepreneurship SAE projects. The list of projects included major areas that involve common unit of measure values, such as head, acre or pen. The project list was developed from interactions with Instructional Materials Service staff and correspondence with agricultural education teachers that served as a pilot test group. Service entrepreneurship SAEs such as businesses (i.e. feed store or hay cutting business) are very different in their investment cost and were not included in the survey list. Examples of included SAE projects are animal, horticulture and crop SAEs. To measure size and value of each SAE area, teachers responded to the numbers of students involved in each area and the typical cost invested to complete each project area.

This survey instrument was pilot–tested in 2006 to Texas agriscience teachers and reviewed by the director of agriculture at Texas Education Agency; they made recommendations to the format and questions. Changes were incorporated to create the final survey instrument. Instrument reliability was established by using 22 SAE involvement questions from the pilot study. These questions and responses resulted in a Cronbach’s alpha value of .80, which established instrument reliability.

Respondents were asked to reply to questions regarding demographics, years of teaching experience, FFA Area, student enrollment in the agricultural education program, and student membership in the FFA. Additionally, respondents described each SAE enterprise in their program with: (a) an estimate of the average expense to raise one unit for each SAE enterprise, (b) the total number of enterprises in their chapter during a 12–month period, and (c) the total number of students in the chapter who had each SAE enterprise. Respondents were also asked to estimate their annual travel miles associated with SAE–related FFA activities, as well as their annual hotel room usage. This study used teacher’s perceived value of cost for each SAE as the most informed person involved in SAEs since they annually provide estimates of cost to parents with students involved in the program and review student’s record books in preparation for FFA awards.

The survey instrument was distributed to agricultural science teachers in Texas via email following Dillman’s (2000) recommendations. The sampling frame was a census drawn from the population of Texas teachers listed in the state agricultural science teacher’s directory. On May 16, 2008, emails were sent to 1,426 teachers throughout Texas representing 975 FFA chapters. Only one response was requested per chapter, and the chapter FFA number was used as a control value. The initial request with two reminder emails resulted in 316 chapters completing the survey. A late series of follow–up emails was sent on June 11, 2008, with 30 additional chapters responding through June 30, 2008. The 346 usable responses represented 35% of the agricultural education programs and FFA chapters in Texas.

Economic values are represented by teachers estimated values required to complete an SAE. These values are then totaled and multiplied to the production agriculture IMPLAN economic impact value ($1.80) to determine economic impact to Texas. The IMPLAN model for estimating additional values beyond direct spending is an input–output model used to measure economic value of particular industry related financial transactions for a particular region. According to Mulkey and Hodges (2003), policymakers, industry officials, and others often need information on the total economic impacts of specific local economic sectors or on the impacts of various changes in the local economy, and these values can be determined using the IMPLAN model. In this study, the related IMPLAN values used were $1.80 for agriculture and $2.09 for travel cost in Texas. These would indicate that additional spending of $1.00 in the agriculture industry or travel industry would result in a total change in local output of $1.80 for agriculture and $2.09 for travel related values in Texas.

Handling non–responses and threats to external validity followed suggestions outlined in Lindner, Murphy, and Briers (2001). In this study, their method 1 procedure for handling non–responses was used. They recommended that if late respondents did not differ from early respondents, then results could be extrapolated to the population. The final attempt to collect responses involved a final “wave” of 30
respondents who were identified as late respondents and used as a comparison group to the 317 early respondents. In an analysis of variance, no significant differences existed between the early and late respondents in key demographic variables such as years of experience, numbers of students in agricultural education, annual hotel rooms used, miles traveled, and economic impact from SAE investments. Because no significant differences were found, results from this sample were extrapolated to represent the population of Texas agriscience programs (N = 975).

**Results / Findings**

The 347 programs included in the data reported 2007–2008 school year enrollments of 51,108 students. Of these, 28,197 were FFA members. According to the Texas FFA, 2007 membership in Texas was approximately 62,000, so chapters responding to this survey represent 45% of Texas FFA membership. Teachers had an average of 13 years of teaching experience, traveled more than 15,000 miles, and utilized 43 hotel rooms.

Responding teachers represented all FFA Areas in Texas, with the highest numbers relating to the highest concentration of teachers in the population—Area III. The population of programs in FFA areas, the percentage of total programs, and the number of programs responding by FFA area, and the percentage of the respondents from each area are reported in Table 1. Sample size is a concern of this research, but table 1 illustrates that the study is a representation of programs within Texas.

<table>
<thead>
<tr>
<th>FFA Area</th>
<th>Population N</th>
<th>%</th>
<th>Sample N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Area I</td>
<td>90</td>
<td>9.74</td>
<td>22</td>
<td>6.34</td>
</tr>
<tr>
<td>Area II</td>
<td>79</td>
<td>8.10</td>
<td>12</td>
<td>3.46</td>
</tr>
<tr>
<td>Area III</td>
<td>153</td>
<td>15.69</td>
<td>62</td>
<td>17.87</td>
</tr>
<tr>
<td>Area IV</td>
<td>72</td>
<td>7.38</td>
<td>27</td>
<td>7.78</td>
</tr>
<tr>
<td>Area V</td>
<td>124</td>
<td>12.72</td>
<td>54</td>
<td>15.56</td>
</tr>
<tr>
<td>Area VI</td>
<td>82</td>
<td>9.13</td>
<td>34</td>
<td>9.80</td>
</tr>
<tr>
<td>Area VII</td>
<td>100</td>
<td>10.26</td>
<td>40</td>
<td>11.53</td>
</tr>
<tr>
<td>Area VIII</td>
<td>96</td>
<td>9.85</td>
<td>37</td>
<td>10.66</td>
</tr>
<tr>
<td>Area IX</td>
<td>84</td>
<td>8.62</td>
<td>29</td>
<td>8.36</td>
</tr>
<tr>
<td>Area X</td>
<td>95</td>
<td>9.74</td>
<td>30</td>
<td>8.65</td>
</tr>
<tr>
<td>TOTAL</td>
<td>975</td>
<td></td>
<td>347</td>
<td></td>
</tr>
</tbody>
</table>

The first objective of this study was to measure the expenses associated with student involvement in entrepreneurship SAEs, or referred to in this study as “investment cost.” These costs are the student or family investment in the experiential learning process. Investment costs could include initial purchase of inputs for sale or associated cost for raising animals such as feed, medications, rent, seed, fertilizer, chemicals, supplies, and rent.

These costs are economically valuable to the local community as they support agricultural producers, feed stores, and other supply/service businesses. As activities in these SAE project areas decrease, so would the corresponding industries providing products. The economic investment values of corresponding SAE enterprises on a Chapter level are listed in Table 2.

Animal SAEs are based on values per head, horticulture/aquaculture SAEs represent units, and crop/forage SAEs are represented in acres. Table 2 contains the frequency of SAEs and illustrates that the most frequently recognized SAE enterprises in Texas are market swine (93%), market goats (86%), and show steers (80%). Animal projects dominate the most common SAEs, but agriculture mechanics was reported by 55% of the sample as an SAE with investment cost. The less frequently recognized
SAE enterprises are equine and crop forage production, but these SAEs represent over $2,000 in SAE investment cost.

Table 2
2007–08 School Year SAE Entrepreneurship Investment Cost

<table>
<thead>
<tr>
<th>SAE Name / Unit</th>
<th>Percent of Programs with SAE</th>
<th>Average Number of SAEs per Program</th>
<th>2007–08 Ave. Investment Per Unit (M)</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Market Swine / hd</td>
<td>93.49</td>
<td>34</td>
<td>$666.10</td>
<td>$406.00</td>
</tr>
<tr>
<td>Market Goats / hd</td>
<td>86.64</td>
<td>19</td>
<td>$515.28</td>
<td>$329.93</td>
</tr>
<tr>
<td>Market Beef Steers / hd</td>
<td>80.00</td>
<td>10</td>
<td>$2,874.06</td>
<td>$2,164.90</td>
</tr>
<tr>
<td>Market Sheep / hd</td>
<td>72.60</td>
<td>12</td>
<td>$653.22</td>
<td>$668.98</td>
</tr>
<tr>
<td>Reg. Show Heifers / hd</td>
<td>66.78</td>
<td>7</td>
<td>$2,921.47</td>
<td>$2,052.78</td>
</tr>
<tr>
<td>Show Broilers / pen</td>
<td>56.85</td>
<td>8</td>
<td>$291.81</td>
<td>$187.51</td>
</tr>
<tr>
<td>Ag Mechanics / each</td>
<td>55.48</td>
<td>11</td>
<td>$1,277.28</td>
<td>$1,696.58</td>
</tr>
<tr>
<td>Breeding Swine / hd</td>
<td>32.53</td>
<td>11</td>
<td>$644.20</td>
<td>$428.70</td>
</tr>
<tr>
<td>Show Heifers / hd</td>
<td>25.68</td>
<td>6</td>
<td>$1,576.63</td>
<td>$1,794.99</td>
</tr>
<tr>
<td>Breeding Beef / hd</td>
<td>22.60</td>
<td>8</td>
<td>$3,677.57</td>
<td>$4,911.49</td>
</tr>
<tr>
<td>Equine / hd</td>
<td>22.26</td>
<td>6</td>
<td>$2,549.38</td>
<td>$3,057.56</td>
</tr>
<tr>
<td>Breeding Goats / hd</td>
<td>18.84</td>
<td>15</td>
<td>$651.82</td>
<td>$740.26</td>
</tr>
<tr>
<td>Horticulture / each</td>
<td>18.15</td>
<td>55</td>
<td>$218.75</td>
<td>$678.78</td>
</tr>
<tr>
<td>Turkeys / pen</td>
<td>18.15</td>
<td>55</td>
<td>$218.75</td>
<td>$421.93</td>
</tr>
<tr>
<td>Floriculture / each</td>
<td>8.22</td>
<td>13</td>
<td>$95.71</td>
<td>$112.98</td>
</tr>
<tr>
<td>Crops/Forages / acre</td>
<td>7.19</td>
<td>11</td>
<td>$2,385.64</td>
<td>$3,882.61</td>
</tr>
<tr>
<td>Dairy Production / hd</td>
<td>5.14</td>
<td>5</td>
<td>$1,384.78</td>
<td>$1,725.05</td>
</tr>
<tr>
<td>Breeding Poultry / pen</td>
<td>4.45</td>
<td>6</td>
<td>$167.50</td>
<td>$287.20</td>
</tr>
<tr>
<td>Aquaculture / each</td>
<td>2.74</td>
<td>1</td>
<td>$366.00</td>
<td>$600.54</td>
</tr>
</tbody>
</table>

A second objective was to measure the associated cost of teacher travel to attend SAE–related FFA events. Travel costs are associated with active agricultural education programs and are activities that add to experiential student learning with an average cost of $12,654 per reporting program. Table 3 illustrates the average travel cost of reporting Texas programs using a standard mileage reimbursement rate and average state hotel room cost.

Table 3
Agriculture Chapter Travel Cost Associated to SAE–related FFA Events

<table>
<thead>
<tr>
<th></th>
<th>Average Reported Values per Program</th>
<th>Average Cost Value ($ per Unit)</th>
<th>Annual Budget Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Annual Miles Traveled</td>
<td>15,040</td>
<td>$.585¹</td>
<td>$8,798</td>
</tr>
<tr>
<td>Average Annually Used Hotel Room Nights</td>
<td>43</td>
<td>$88.92²</td>
<td>$3,856</td>
</tr>
<tr>
<td>Total Budget Cost</td>
<td></td>
<td></td>
<td>$12,654</td>
</tr>
</tbody>
</table>

¹ Texas reimbursement cost
² Using Texas Travel Institute 2007 Annual Hotel Rate

The third and fourth objectives were to measure the average investment cost per chapter and calculate estimated total economic value to local and state economies. The costs are
associated cost of experiential learning with entrepreneurship SAEs as well associated travel cost as reported by Texas teachers.

Table 4 is a complete list of the results. Market swine are the most common type of entrepreneurship SAE, with an average chapter investment of $17,772, and the most contributing SAE with over $17 million in direct expenses to the Texas economy. In comparison, some lower frequency SAEs, such as show steers and heifers actually have a higher total value than some higher frequency SAE programs. Show steer SAEs represented over $17 million, and registered show heifers represented $13.6 million in state SAE direct expenses. Agricultural mechanics SAE frequency was slight over 50% of programs, and these programs represented SAE statewide spending of over $5.7 million.

Table 4

<table>
<thead>
<tr>
<th>SAE Type</th>
<th>Average Chapter Investment Value</th>
<th>Average SAE Investment Value to Texas Economy (975 Programs)</th>
<th>Economic Impact of SAE Programs (IMPLAN Multi)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Market Swine</td>
<td>$17,772</td>
<td>$17,327,562</td>
<td>$31,189,611</td>
</tr>
<tr>
<td>Market Goat</td>
<td>$6,681</td>
<td>$6,514,437</td>
<td>$11,725,987</td>
</tr>
<tr>
<td>Market Beef (show steer)</td>
<td>$17,657</td>
<td>$17,215,428</td>
<td>$30,987,771</td>
</tr>
<tr>
<td>Commercial Show Steer</td>
<td>$6,991</td>
<td>$6,816,285</td>
<td>$12,269,313</td>
</tr>
<tr>
<td>Market Sheep</td>
<td>$4,656</td>
<td>$4,539,208</td>
<td>$8,170,574</td>
</tr>
<tr>
<td>Reg. Show Heifer</td>
<td>$14,028</td>
<td>$13,677,447</td>
<td>$24,619,404</td>
</tr>
<tr>
<td>Broilers</td>
<td>$1,220</td>
<td>$1,189,547</td>
<td>$2,141,184</td>
</tr>
<tr>
<td>Ag Mechanics</td>
<td>$5,926</td>
<td>$5,778,130</td>
<td>$10,400,635</td>
</tr>
<tr>
<td>Breeding Swine</td>
<td>$2,105</td>
<td>$2,052,502</td>
<td>$3,694,504</td>
</tr>
<tr>
<td>Commercial Show Heifer</td>
<td>$2,587</td>
<td>$2,522,378</td>
<td>$4,540,281</td>
</tr>
<tr>
<td>Breeding Beef</td>
<td>$3,926</td>
<td>$3,827,459</td>
<td>$6,889,427</td>
</tr>
<tr>
<td>Equine</td>
<td>$3,463</td>
<td>$3,376,338</td>
<td>$6,077,409</td>
</tr>
<tr>
<td>Breeding Goat</td>
<td>$1,667</td>
<td>$1,625,292</td>
<td>$2,925,525</td>
</tr>
<tr>
<td>Horticulture</td>
<td>$729</td>
<td>$710,565</td>
<td>$1,279,016</td>
</tr>
<tr>
<td>Turkeys</td>
<td>$499</td>
<td>$486,144</td>
<td>$875,060</td>
</tr>
<tr>
<td>Breeding Sheep</td>
<td>$597</td>
<td>$582,282</td>
<td>$1,048,108</td>
</tr>
<tr>
<td>Floriculture</td>
<td>$94</td>
<td>$91,807</td>
<td>$165,252</td>
</tr>
<tr>
<td>Crop/Forage Production</td>
<td>$1,570</td>
<td>$1,531,020</td>
<td>$2,755,837</td>
</tr>
<tr>
<td>Dairy</td>
<td>$960</td>
<td>$936,100</td>
<td>$1,684,980</td>
</tr>
<tr>
<td>Breeding Poultry</td>
<td>$68</td>
<td>$65,879</td>
<td>$118,583</td>
</tr>
<tr>
<td>Aquaculture</td>
<td>$27</td>
<td>$25,898</td>
<td>$46,616</td>
</tr>
</tbody>
</table>

| Total SAE Values      | $93,222                         | $90,891,709                                                 | $163,605,076                                 |
| Travel Reported Value | $12,654                         | $12,338,115                                                 | $25,786,661                                  |
| Total Value           | $105,877                        | $103,229,824                                                | $189,391,737                                 |

1Represents the average value of all responding chapters
2SAE Investment values for all 975 programs in Texas
3IMPLAN Economic Impact values for all 975 programs using $1.80 IMPLAN–Ag & $2.09 for Travel Cost

Table 4 also illustrates economic impacts using the IMPLAN multiplier type II (1.80 for agriculture products). Greater average chapter spending versus frequency in a specific SAE area is also equal to that SAE are representing the highest economic impact, which is evident in the market swine SAE representing over $31 million in economic values to Texas economy and show steers representing almost $31 million. Agricultural mechanics SAE projects represent a
statewide economic value of over $10 million with others listed in table 4.

Table 4 combines previously reported travel expense values, as reported in table 3 and represent $12,654 per SAE program. Travel values add over $12 million in total SAE directed spending and an economic value of over $25 million (using IPLAN model value of $2.09).

The total SAE value for an average agriscience program in Texas is $93,222 in direct SAE annual investment cost, $12,654 in associated travel, and a total of $105,877 in average direct spending. Extrapolating to all Texas programs, there is an estimated $103 million in direct spending. This value of direct spending represents $189 million in economic impacts that include the ripple effects of spending to the entire Texas economy. The fifth objective was to measure the economic impact per student. Comparing values for the 62,000 FFA members in Texas, the average FFA student represents $1,665 in direct spending value, and $3,055 in economic impact value, to the Texas economy.

Conclusions

The purpose of this study was to create a new methodology of research that defines the total economic value agricultural SAE program and related expenses that support experiential learning. This approach offers a new assessment model to determine economic values of experiential learning, which considering previous research is a valuable educational tool.

The first objective was to measure the different types of SAE Entrepreneurship projects and associated investment cost. Based on the data gathered in this study, it is concluded that market swine, market goats, and market beef animals are the most prevalent SAE projects in Texas. Although many have called for a diversification of SAE projects, it would appear that programs in Texas still embrace more traditional entrepreneurial animal projects. These projects are also the most economically valuable SAEs.

The second objective was to measure other expenses paid by chapters such as travel cost for SAE exhibits and FFA events. Based on values reported by teachers, it was concluded that each FFA chapter paid $ 12,654 in travel–related expenses. Comparison data from other states could not be found. This is the investment cost, but likely not all state supported as teachers travel accounts are not likely to be supported at $12,000 per year.

The third objective was to develop the average cost for a school’s SAE projects. Data reported by teachers led the researchers to conclude that each school had a total investment in SAE projects of $ 93,222. This exceeds the most current average economic value by Retallick and Martin (2005) who found $75,888 per program when using placement SAE income. A conclusion is that SAE investment cost versus placement incomes are a higher measure of economic value.

The fourth objective was to estimate the total investment value for all SAE projects and travel cost in Texas and associated economic impacts. Based on the data collected, it was concluded that total value for all programs in Texas cause an estimated $103 million in SAE investment cost. This direct spending for SAE projects then represents $189 million in economic impact to Texas, which is a significant value to the state’s economy. These values also relate to the fifth objective to determine the SAE and other cost per student in agricultural education. As additional students enter agriculture education programs and are involved in SAE projects, there is likely an increase in total economic values.

Expense values translate into local and state business income, which encourage jobs and economic growth. These are then potentially the economic benefits suggested by Cole and Connell (1993) as an approach to measuring economic value of SAE programs.

Recommendations/Limitations

The actual cost of each student’s SAE projects from a student perspective remains difficult to determine and is a limitation of this study. However, research relating to the investment cost of student SAEs is largely unknown and this study provides a methodology and estimation of value. A statewide, or perhaps national, system should be developed to track SAE investment, expenditures, and receipts from the students themselves. FFA record books are potentially a tool, but sometimes lack consistency in the way these values are collected.
and lack of distribution to all students enrolled in agriculture education.

An additional limitation is sample size, but potentially is addressed by the study following the alignment of FFA areas in Texas. However, sample size is a concern, but will be addressed in future studies by increasing opportunity for involvement, greater sharing of results with stakeholders and potentially developed a random sample approach to increase validity.

As mentioned by other researchers, the economic values derived from this study offer enormous opportunity to promote the positive economic contributions of SAEs. Further research should be conducted to establish the local and state economic value of agriscience programs. Recommendation could be including other SAE areas and improving the use of record books to all students in agriculture education. Combining these data with known educational values would improve the overall assessment model of program quality and value.

One targeted result of this study is the value of these results related with weighted funding that Texas schools receive for students in career and technical programs, including agricultural education. These values are increasingly scrutinized during state budget meetings, so a recommendation to compare economic values to funding may result in measurement of value. In general, there is a growing effort to increase the fiscal accountability across the state budget. Improved assessment of SAE programs will provide solid evidence in support of continued state investment.

References


GARY E. BRIERS is a Professor in the Department of Agricultural Leadership, Education and Communications at Texas A&M University. 107 Scoates Hall, Texas A&M University College Station, TX 77843-2116, g-briers@tamu.edu

JAMES R. LINDNER is a Professor in the Department of Agricultural Leadership, Education and Communications at Texas A&M University. 107 Scoates Hall, Texas A&M University College Station, TX 77843-2116, j-lindner@tamu.edu
Food Safety Inservice Educational Needs of Agriculture Teachers

Vikram Koundinya, Graduate Assistant
Robert A. Martin, Professor
Iowa State University

The purpose of this census study was to determine the food safety inservice educational needs of agriculture teachers in Iowa. The population for this study was all of the 211 agriculture teachers in the state out of which 161 were accessible. The response rate was 54.03% of the accessible population and 41.23% of the total population. Eleven food safety topics were identified with input from experts in agricultural education, food science and human nutrition, and animal science, as well as some input from the agriculture teachers themselves. The teachers were asked to rate the extent of their perceived need for inservice education on each topic on a six–point Likert–type scale. The findings indicated that these teachers needed more inservice education on all of these topics. Teachers indicated a greater need for inservice education focusing on foodborne illnesses, food safety, bacterial contamination, food irradiation, food processing, and pesticide pollution. Hence, these topics were identified as the critical professional development areas in food safety. It was recommended that all of the topics be included in the food safety inservice programs for agriculture teachers, with priority given to the identified critical professional development areas.

Keywords: Inservice needs, Professional development, Agriculture teachers, Food safety education

Introduction and Theoretical Framework

According to Buzby (2001), “Food safety has emerged as an important global issue with international trade and public health implications” (p.55). Food safety is a global issue and foodborne illnesses occur in both developing and developed countries (Kaferstein & Abdussalam, 1999), which implies that even the United States is not exempt from food safety problems despite the strict regulatory measures in place. Ellis (2006) stated that food–related illnesses are a serious issue in the United States. Nordstrom, Wilson, Richards, Fivek, Ruffing, and Coe (1999) stated that people are concerned about food safety when they think about animal agriculture, but it is postulated that the case is no different with any other segment of the agriculture industry.

Around 76 million cases of foodborne diseases occur annually in the United States and it is estimated that there are 325,000 hospitalizations and 5,000 deaths annually owing to foodborne diseases (Centers for Disease Control and Prevention [CDC], 2007). According to the Iowa Department of Inspections and Appeals, in 2007 there were 581 and in 2008 there were 76 food–related cases investigated, respectively. The numbers represent only a fraction of the actual numbers, because only a small percentage of the cases get reported (Iowa Department of Public Health [IDPH], 2008).

Among these cases, young children fall under the high–risk category for foodborne illnesses (IDPH, 2008). Learning safe food practices at an early age is beneficial in the long run, and ensuring that all students receive food safety education is critical (Food and Drug Administration [FDA], 1998). Young people especially should be the target for education in agriculture because people tend to shape their perceptions at an early stage, and changing those perceptions becomes more difficult later in life (Holz–Clause & Jost, 1995).

The Michigan Integrated Food and Farming System (MIFFS) has suggested that increased food system education in the schools is needed...
so that people can make more informed choices about the food they eat (Trexler, Johnson, & Heinze, 2000). Many young people do not know the importance of food in maintaining their health. “...Food is seen by youth as entertainment rather than as a source of nutrition” (Trexler et al., 2000, p.34). Families are one of the important sources of information about food, and young people tend to follow what is modeled at home (Trexler et al., 2000). However, this source of information is not always a very knowledgeable one. Therefore, school teachers need to provide food safety education.

The British Nutrition Foundation (2001) stated that for students to receive proper food safety education, teachers must possess sound knowledge and understanding about food and nutrition. This is achievable by correctly identifying their needs and addressing them in professional development programs. Layfield and Dobbins (2002) concurred that a crucial factor in developing successful teachers is correctly identifying their needs. Koundinya and Martin (2008) found that agricultural teachers have a variety of needs and recommended adapting inservice education to these needs.

Inservice education is one of the ways of improving school programs (Christensen, Warnick, Spielmaker, Tarpley, & Straquadine, 2006). Schunk (2008) stated, “There is no substitute for strong professional development among teachers” (p.273). He further stated that teachers must keep up to date on the advances in their fields. These statements stress the importance of inservice education for teachers, and for inservice to be effective, teachers’ needs have to be properly identified and addressed through professional development.

Hence, it is essential to identify the agriculture teachers’ inservice needs related to food safety education. Even though family and consumer sciences teachers may teach about food safety in their programs, agriculture teachers also teach about food safety from a different perspective because food is a product of agriculture. Little research has been done on identifying these needs. In this context, this study is significant.

The theory of planned behavior (TPB) postulated by Icek Ajzen served as the theoretical framework for this study. According to the TPB, a person’s intentions to perform behaviors can be predicted from attitudes toward the behavior, subjective norms, and perceived behavioral control. Intentions and perceived behavioral control are the major factors influencing a person’s actual behavior (Ajzen, 1991). Perceived behavioral control is a person’s perception of his/her ability to perform a given behavior (Ajzen, 2006). This could mean that agriculture teachers perceptions about a topic like food safety and food safety inservice needs could influence behavioral traits like wanting to have more instructional materials and attending inservice workshops.

The Standards Assessments of the University Teacher Education Program (UTEP) at the Iowa State University served as the conceptual framework for this study (Iowa State University Teacher Education Program, 2005). The following are the eight Standards and Criteria that this university uses: The teacher:

1. demonstrates ability to enhance academic performance and support for implementation of the school district student achievement goals;
2. demonstrates competence in knowledge appropriate to the teaching position;
3. demonstrates competence in planning and preparing for instruction;
4. uses strategies to deliver instruction that meet the multiple learning needs of students;
5. uses a variety of methods to monitor student learning;
6. demonstrates competence in classroom management;
7. engages in professional growth, and
8. fulfills professional responsibilities established by school district.

This study addressed “Standard 2.” The findings from this study would indicate the extent to which the teachers meet the standard of being competent in the knowledge about what they teach in their programs.

Purpose and Objectives

The purpose of this study was to determine the food safety inservice educational needs of agriculture teachers in Iowa. The study had the following objectives:
1. To determine the perceptions of agriculture teachers about food safety issues,
2. To determine the extent to which the agriculture teachers were teaching the identified food safety topics in their programs, and
3. To determine the agriculture teachers’ perceived inservice needs for the identified food safety topics.

Methods

The Institutional Review Board at the Iowa State University approved this study. An electronic census survey was e-mailed to all agriculture teachers in Iowa using SurveyMonkey®. The population for this study was all 211 agriculture teachers in Iowa out of which 161 served as the accessible population. Fifty teachers were not accessible. Some had changed schools and the move was not updated on the directory, while others had declined to participate in surveys via SurveyMonkey®. The agriculture teacher directory obtained from the Iowa State Department of Education served as the sampling frame. Internal validity concerns inherent in survey research were addressed by using a suitable, reliable and valid measurement tool that could reduce measurement error.

A questionnaire was developed for collecting information from the agriculture teachers. A six-point Likert-type scale was used to collect data pertaining to the three stated objectives that represented sections 1, 2, and 3, respectively, of the questionnaire. There were 8, 11, and 11 items in sections 1, 2, and 3, respectively. Two negative statements (items 5 and 8) were included in section 1 (perceptions about food safety) to identify any response set bias. For measuring the perceptions about food safety (section 1), the scale used was from 1 = Very Strongly Disagree (VSD) to 6 = Very Strongly Agree (VSA). For measuring the extent to which the food safety topics were taught in their programs (section 2), the scale used was from 0 = Not Taught (NT) to 5 = Very Great Extent (VGE). For measuring the perceived inservice need for the food safety topics (section 3), the scale used was from 0 = None (N) to 5 = Very High Need (VHN). The scale started with 0 for sections 2 and 3 because 0 meant absence of the variable being measured.

The questionnaire was validated by an expert panel for face and content validity. The expert panel consisted of professors from the departments of agricultural education, animal science, and food science and human nutrition at the Iowa State University. The questionnaire was pilot–tested with agriculture teachers, and the data were used to establish the reliability of the questionnaire. The agriculture teachers that participated in the pilot test were excluded from the population. For reliability of the questionnaire, Cronbach’s α was computed from the data collected in the pilot test. Values of .922, .876, and .925 were reported for sections 1 (perceptions about food safety), 2 (extent taught), and 3 (perceived inservice needs), respectively. George and Mallery (2003) gave the following rule of thumb that is applicable to most situations: > .9 – excellent, > .8 – good, > .7 – acceptable, > .6 – questionable, > .5 – poor, and < .5 – unacceptable. So, the questionnaire used for this study was considered reliable.

The food safety perception statements of section 1 and the food safety topics in sections 2 and 3 were identified by the researchers with help from the expert panel. In addition to input from experts, input to identify the food safety topics under sections 2 and 3 was taken from the agriculture teachers when they attended a food safety workshop conducted by the department of agricultural education at Iowa State University. As part of the workshop credit requirement, the agriculture teachers developed lesson plans for teaching food safety. The topics identified for this study had similarities with these lesson plans. Since the topics were identified adopting a participatory approach, they were considered to be need based.

The agriculture teachers were mailed an email letter informing the purpose of the research. This letter sought their cooperation, and it was made clear that their participation in this study was completely voluntary and they could withdraw at any time they wished. It was also ensured that any changes in the study’s objectives would be shared with them. After that the survey was emailed to them and a total of four follow–ups were conducted at suitable time intervals. Their consent for the study was assumed if they filled out the questionnaire.

The study had two limitations. First, 50 teachers out of the total population of 211 were not accessible, so the questionnaire was sent to
only 161 teachers, who served as the accessible population. Second, this study had a response rate of 54.03% of the accessible population and 41.23% of the total population. According to Lindner, Murphy, and Briers (2001) any response rate of less than 85% could result in significant differences between early and late respondents, thus affecting the external validity of the study. One of the methods for handling nonresponse error is comparing early to late respondents (Dooley & Lindner, 2003; Miller & Smith, 1983). The two limitations were accounted for by comparing early and late respondents using an independent samples $t$-test. There were no statistically significant differences at the 0.05 level of significance suggesting that the results could be generalized to the non–respondents and inaccessible population. So, these two limitations were reasonably considered as not threats to external validity. For the purpose of this study early respondents were defined operationally as those subjects who responded to the first mailing and the first follow–up, and those who responded after that were treated as late respondents.

Findings

Eighty–seven teachers responded to the survey, resulting in a response rate of 54.03% for the 161 accessible teachers and 41.23% for the total population of 211. An independent samples $t$–test was used to test for any statistically significant differences between early and late respondents. Early and late respondents were compared on the summated mean score for section 1, mean scores for all the food safety topics in sections 2 and 3, age, and teaching experience. There were no statistically significant differences between the two groups at the .05 level of significance. The data were analyzed using SPSS® version 17.0, and the findings are presented below.

Demographic Profile of the Agriculture Teachers

The respondents had a mean teaching experience of 18 years, with a standard deviation of 10.60. Their teaching experience ranged from 1–37 years. The mean age of the respondents was 42.41 years with a standard deviation of 11.32. The respondents ranged from 24 to 65 years of age. Since outliers were detected in the age category, a median was calculated to account for the skewed distribution. The median age of the respondents was 46 years, indicating that the age distribution was negatively skewed. A majority (78.6%) of the respondents were male, and had earned a bachelor’s degree (73.3%).

Objective 1

Perceptions about food safety were calculated using the mean score of the eight food safety statements. It was defined operationally such that a score of $\leq 3.00$ would be considered as a low or negative perception, a score of $3.01$–$4.50$ as moderate, and $\geq 4.51$ as high or positive perception about food safety on the six–point Likert–type scale that ranged from 1–6. The respondents had a mean score of 4.32, with a standard deviation of .41, indicating that they had moderate perceptions about food safety.

The frequency distribution, means, and standard deviations of the food safety statements (Table 1) indicated that only three out of the eight food safety statements: “food safety includes many different aspects from farm to table,” “high school agriculture teachers must be educated on food safety issues,” and “pesticide residues affect food safety” had a majority ($>50\%$) of the respondents on either extreme (Very Strongly Disagree + Strongly Disagree and Strongly Agree + Very Strongly Agree) of the scale.
Table 1  
*Frequency Distribution, Mean, and Standard Deviation scores of Agriculture Teachers Based on their Perceptions About Food Safety*

<table>
<thead>
<tr>
<th>Food safety perception statement</th>
<th>f</th>
<th>M</th>
<th>SD</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food safety includes many different aspects from farm to table</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>11</td>
</tr>
<tr>
<td>High school agricultural teachers must be educated on food safety issues</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>32</td>
</tr>
<tr>
<td>I am willing to pay extra for irradiated food</td>
<td>5</td>
<td>5</td>
<td>37</td>
<td>33</td>
</tr>
<tr>
<td>One can prevent many diseases by consuming irradiated products</td>
<td>3</td>
<td>3</td>
<td>8</td>
<td>53</td>
</tr>
<tr>
<td>The quality of food deteriorates when irradiation is used</td>
<td>1</td>
<td>12</td>
<td>48</td>
<td>16</td>
</tr>
<tr>
<td>Pesticide residues affect food safety</td>
<td>2</td>
<td>2</td>
<td>10</td>
<td>29</td>
</tr>
<tr>
<td>Irradiated food packets have a special symbol indicating they are irradiated</td>
<td>0</td>
<td>3</td>
<td>22</td>
<td>40</td>
</tr>
<tr>
<td>Irradiation decreases the shelf–life of fruits</td>
<td>9</td>
<td>17</td>
<td>47</td>
<td>10</td>
</tr>
</tbody>
</table>

1= Very Strongly Disagree, 2= Strongly Disagree, 3= Disagree, 4= Agree, 5= Strongly Agree and 6= Very Strongly Agree

Further, the mean scores (Table 1) of only two statements “food safety includes many different aspects from farm to table” \((M = 5.34, SD = .69)\) and “high school agriculture teachers must be educated on food safety issues” \((M = 4.84, SD = .75)\) fell under the VSA and SA categories which were operationally defined as high perception category. This explains for the moderate perceptions of agriculture teachers about food safety.

**Objective 2**

The frequency distribution (Table 2) for the extent to which agriculture teachers taught the identified food safety topics indicated that a majority of the teachers taught the listed topics from “Not Taught” to “Some Extent” on the scale. It was found that all the topics except food chain had a majority of the teachers in the categories: “Not Taught,” “Low Extent,” and “Some Extent” added together.
Table 2
*Frequency Distribution, Mean, and Standard Deviation scores of Agriculture Teachers Based on the Extent to which Selected Food Safety Topics Were Taught*

<table>
<thead>
<tr>
<th>Topic</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>M</th>
<th>SD</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food irradiation</td>
<td>39</td>
<td>24</td>
<td>20</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>0.87</td>
<td>0.92</td>
<td>87</td>
</tr>
<tr>
<td>Food chain</td>
<td>4</td>
<td>17</td>
<td>17</td>
<td>35</td>
<td>12</td>
<td>1</td>
<td>2.43</td>
<td>1.13</td>
<td>86</td>
</tr>
<tr>
<td>Foodborne illnesses</td>
<td>10</td>
<td>21</td>
<td>33</td>
<td>13</td>
<td>8</td>
<td>2</td>
<td>1.93</td>
<td>1.19</td>
<td>87</td>
</tr>
<tr>
<td>Chemical analysis of foods</td>
<td>25</td>
<td>33</td>
<td>17</td>
<td>9</td>
<td>3</td>
<td>0</td>
<td>1.21</td>
<td>1.08</td>
<td>87</td>
</tr>
<tr>
<td>Food processing</td>
<td>7</td>
<td>16</td>
<td>33</td>
<td>17</td>
<td>13</td>
<td>1</td>
<td>2.18</td>
<td>1.17</td>
<td>87</td>
</tr>
<tr>
<td>Bacterial contamination</td>
<td>11</td>
<td>27</td>
<td>29</td>
<td>14</td>
<td>6</td>
<td>0</td>
<td>1.73</td>
<td>1.09</td>
<td>87</td>
</tr>
<tr>
<td>Pesticide pollution</td>
<td>6</td>
<td>16</td>
<td>38</td>
<td>17</td>
<td>9</td>
<td>1</td>
<td>2.11</td>
<td>1.08</td>
<td>87</td>
</tr>
<tr>
<td>Safe food preparation</td>
<td>13</td>
<td>22</td>
<td>28</td>
<td>12</td>
<td>10</td>
<td>1</td>
<td>1.85</td>
<td>1.25</td>
<td>86</td>
</tr>
<tr>
<td>Food transportation</td>
<td>9</td>
<td>31</td>
<td>24</td>
<td>15</td>
<td>8</td>
<td>0</td>
<td>1.79</td>
<td>1.13</td>
<td>87</td>
</tr>
<tr>
<td>Food safety</td>
<td>5</td>
<td>18</td>
<td>25</td>
<td>26</td>
<td>11</td>
<td>2</td>
<td>2.29</td>
<td>1.17</td>
<td>87</td>
</tr>
<tr>
<td>Food preparation in retail food service</td>
<td>24</td>
<td>27</td>
<td>24</td>
<td>10</td>
<td>2</td>
<td>0</td>
<td>1.29</td>
<td>1.06</td>
<td>87</td>
</tr>
</tbody>
</table>

0= Not taught, 1= Low Extent, 2= Some Extent, 3= Moderate Extent, 4= Great Extent and 5= Very Great Extent

Also, none of the food safety topics had a high mean score (Table 2), the maximum being 2.43 for the topic food chain, indicating that they were not being taught to a great extent or very great extent by these agriculture teachers.

**Objective 3**

The frequency distribution (Table 3) of agriculture teachers based on their perceived inservice needs on the identified food safety topics indicated that a great majority of the teachers believed that they had at least some need for inservice education on all the identified food safety topics.

Table 3
*Frequency Distribution, Mean, and Standard Deviation scores of Agriculture Teachers Based on the Perceived Inservice Need for Selected Food Safety Topics*

<table>
<thead>
<tr>
<th>Topic</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>M</th>
<th>SD</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food irradiation</td>
<td>0</td>
<td>5</td>
<td>31</td>
<td>27</td>
<td>19</td>
<td>5</td>
<td>2.86</td>
<td>1.01</td>
<td>87</td>
</tr>
<tr>
<td>Food chain</td>
<td>2</td>
<td>10</td>
<td>34</td>
<td>26</td>
<td>11</td>
<td>4</td>
<td>2.52</td>
<td>1.07</td>
<td>87</td>
</tr>
<tr>
<td>Foodborne illnesses</td>
<td>0</td>
<td>3</td>
<td>33</td>
<td>24</td>
<td>21</td>
<td>6</td>
<td>2.93</td>
<td>1.02</td>
<td>87</td>
</tr>
<tr>
<td>Chemical analysis of foods</td>
<td>1</td>
<td>13</td>
<td>28</td>
<td>31</td>
<td>10</td>
<td>4</td>
<td>2.55</td>
<td>1.06</td>
<td>87</td>
</tr>
<tr>
<td>Food processing</td>
<td>0</td>
<td>7</td>
<td>20</td>
<td>33</td>
<td>22</td>
<td>5</td>
<td>2.97</td>
<td>1.02</td>
<td>87</td>
</tr>
<tr>
<td>Bacterial contamination</td>
<td>0</td>
<td>5</td>
<td>24</td>
<td>24</td>
<td>24</td>
<td>10</td>
<td>3.11</td>
<td>1.11</td>
<td>87</td>
</tr>
<tr>
<td>Pesticide pollution</td>
<td>0</td>
<td>8</td>
<td>22</td>
<td>29</td>
<td>19</td>
<td>7</td>
<td>2.94</td>
<td>1.09</td>
<td>85</td>
</tr>
<tr>
<td>Safe food preparation</td>
<td>1</td>
<td>10</td>
<td>20</td>
<td>30</td>
<td>19</td>
<td>7</td>
<td>2.88</td>
<td>1.15</td>
<td>87</td>
</tr>
<tr>
<td>Food transportation</td>
<td>1</td>
<td>10</td>
<td>22</td>
<td>35</td>
<td>13</td>
<td>6</td>
<td>2.77</td>
<td>1.09</td>
<td>87</td>
</tr>
<tr>
<td>Food safety</td>
<td>0</td>
<td>2</td>
<td>17</td>
<td>26</td>
<td>28</td>
<td>12</td>
<td>2.36</td>
<td>1.03</td>
<td>85</td>
</tr>
<tr>
<td>Food preparation in retail food service</td>
<td>2</td>
<td>14</td>
<td>25</td>
<td>28</td>
<td>13</td>
<td>5</td>
<td>2.58</td>
<td>1.16</td>
<td>87</td>
</tr>
</tbody>
</table>

0=No Need, 1=Low Need, 2=Some Need, 3=Moderate Need, 4=High Need and 5=Very High Need

The mean scores (Table 3) for perceived inservice need of all the food safety topics were in agreement with the frequency distribution that a great majority of the teachers believed that
they had at least some need for inservice education, as all of the food safety topics had a mean perceived inservice need score of more than 2.00. This information indicates that a majority of the agriculture teachers in Iowa perceived that they needed inservice education to adequately teach identified food safety topics.

Conclusions, Discussion, Implications, and Recommendations

Four major conclusions were drawn based on the findings from this study. First, agriculture teachers in Iowa were mainly middle-aged men with substantial years of teaching experience who held a bachelor’s degree. Layfield and Dobbins (2002) found that South Carolina agriculture teachers had a mean teaching experience of 14.7 years and that the majority had earned a master’s degree. Thobega and Miller (2003) found that a majority of the Iowa agriculture teachers were men with a bachelor’s degree. The mean age was 39 years and the mean time of teaching experience was 14 years. The findings from this study echoed the findings of Layfield and Dobbins as well as those of Thobega and Miller as they related to age, gender, and teaching experience, but they differed on educational qualifications, which were only in conformity with Thobega and Miller’s study.

Second, these agriculture teachers had moderate perceptions about food safety. Research (Dijksterhuis & Bargh, 2001; Ferguson & Bargh, 2004) shows that perceptions can influence behavior. Also, the Theory of Planned Behavior (TPB) suggests that perceptions can influence behavior. The findings indicated that although overall perceptions toward food safety were at a moderate level, all the agriculture teachers agreed with the statement that they should be educated on food safety issues. From this, it is reasonable to assume that the teachers may be interested in attending inservice workshops. During these workshops, there is a possibility that their perceptions may change to a higher or more positive level, which in turn may lead to a behavioral change of seeking more information about food safety. Hence, it is recommended that more inservice education on food safety be available to agriculture teachers.

Third, at least to some extent the agriculture teachers were teaching food safety in their programs. Newman and Johnson (1993) found that a majority of agriculture teachers taught a unit on principles of food science. Agriculture teachers identified topics related to food science principles as important in their agriscience programs (Newman & Johnson, 1994). The findings from this study supported the findings from the other two studies that agriculture teachers do teach about food safety in their programs. Further, it was found that a large number of the teachers were not teaching the topic of food irradiation in their programs. More than one quarter of the teachers were not teaching the topics chemical analysis of the food stuffs and food preparation in retail food service. These results indicate that agriculture teachers were teaching about food safety in their programs, but not to a very great extent.

There may be different reasons behind this finding. The agriculture teachers may not be very competent to teach food safety topics and hence were not teaching them in their programs. Newman and Johnson (1994) found that agriculture teachers were not highly competent in teaching topics related to principles of food science. Research should be conducted to determine the competence of agriculture teachers in teaching about food safety, and inservice education should be designed based on the findings. Also, the teachers in family and consumer sciences may already be teaching some of these topics. In that case, the agriculture teachers should collaborate more with these teachers. Future research should determine the extent of current collaboration, and also explore the probable options for future collaboration. Also, curricula may not be up-to-date. In this case, the agriculture teachers should be provided with newer curricula. Newman and Johnson found that a majority (82.8%) of the agriscience teachers needed additional instructional materials for teaching food science. Future research should also determine the agriculture teachers’ needs for newer curricula to teach about food safety.

Fourth, a majority of agriculture teachers needed inservice education on food safety. A majority of the teachers had at least some need for inservice education in all the identified topics. Roberts and Dyer (2004) found that 46% and 30% of the traditionally and alternatively certified agriculture teachers, respectively, had a high need for inservice education on topics
related to food science and safety. Agriculture teachers have a strong need for inservice on topics related to the food industry (Newman & Johnson, 1994). The findings from this study were in conformity with the other cited studies, indicating that agriculture teachers are in need of inservice education in order to adequately teach food safety.

It was further found that for the topics foodborne illnesses, food safety, bacterial contamination, food irradiation, food processing, and pesticide pollution, teachers had some to a very high need (Table 3) compared to other areas. Hence, they were identified as critical professional development areas. Therefore, it is recommended that priority should be given to these critical professional development areas during the inservice workshops.

Further, the findings from this study have implications for developing curricula for future food safety workshops. Findings from this study indicated the areas where agriculture teachers need education, and this could be utilized in designing effective future inservice workshops. As mentioned previously, input was also taken from the agriculture teachers in developing the food safety topics in the survey questionnaire, so that the educational material could be adapted for future inservice workshops to make them more meaningful and applicable for classroom use.

The findings and conclusions from this study are important for agriculture teachers to meet the standard of knowledge competency in what they teach, as conceptualized by the Iowa State University Teacher Education Program. The findings from this study suggest that agriculture teachers of this state may not yet be completely meeting this standard, which indicates the need for inservice on food safety topics.

Based on the overall findings from this study, it is also recommended that periodic needs assessment should be conducted on food safety teaching–related inservice needs of the agriculture teachers because food safety education at the secondary school level is very important as suggested by MIFFS (Trexler et al., 2000) and FDA (1998).

As suggested by Buzby (2001), food safety has become a critical concern, and an issue that merits the attention of educators in all kinds of settings. Food safety is a reality and educational programs require attention to all the issues related to food safety. High school agriculture teachers are inclined to teach about food safety in their programs. For this to happen, agriculture teachers need to be competent in teaching about food safety. This standard can be achieved by identifying their needs and addressing them with inservice education.

References


Iowa Department of Public Health (2008 September). *What should you do if you think you have a food-related illness?* (Press Release). Des Moines, Iowa.


VIKRAM KOUNDINYA is a Graduate Assistant in the Department of Agricultural Education and Studies at the Iowa State University, 223 Curtiss Hall, College of Agriculture and Life Sciences, Ames, IA 50010. E–mail: vikram@iastate.edu

ROBERT A. MARTIN is a Professor in the Department of Agricultural Education and Studies at the Iowa State University, 201 Curtiss Hall, College of Agriculture and Life Sciences, Ames, IA 50010. E–mail: drmartin@iastate.edu

This article is a product of the Iowa Agriculture and Home Economics Experiment Station, Ames, Iowa, Project No. 3613 and was sponsored by the Hatch Act and State of Iowa.
Using Case–Scenarios to Determine the Perceptions of Secondary Agriculture Teachers and 4-H Youth Development Personnel Regarding Interorganizational Cooperation

Billy R. McKim, Extension Project Specialist  
Texas A & M University  
Robert M. Torres, Professor & Department Head  
University of Arizona

The Prisoners Dilemma (Axelrod, 1984) served as a basis for determining the levels of cooperative behavior secondary agriculture teachers and 4-H youth development Extension personnel exhibited in response to two case–scenarios. Additionally, the study sought to determine if the interorganizational cooperation was positively or negatively interdependent. A simple random sample (n = 210) was taken from secondary agriculture teachers (N = 414) in Missouri and a census of 4-H youth development personnel (N = 91) employed by the University of Missouri Extension was taken at the time of this study. A mixed–mode design was implemented for data collection, which was accomplished using mailed and electronic questionnaires. Responses to the two case–scenarios indicated levels of cooperation varied depending on the context of the situation. The existence or absence of competition also appeared to shift the level of cooperation to or from pure cooperation. In addition, the cooperative behaviors of secondary agriculture teachers and 4-H youth development personnel differed regarding the level of cooperation desired, thereby affecting whether interdependence was positive or negative.

Keywords: cooperation; 4-H youth development personnel; secondary agriculture teachers

Introduction

In cooperative or competitive situations, one’s focus is usually on the goal, outcome, or reward sought. Without a goal, outcome, or reward, interdependence is unlikely; thus diminishing any reason to cooperate or compete (Johnson & Johnson, 2009). One example of a situation allowing for cooperation or competition is the relationship of secondary agriculture teachers and 4-H youth development personnel. The Smith–Hughes Act and the Smith–Lever Act funded two separate educational systems; despite that, the federal government supported both systems, and both addressed the need for educating people in agriculture (Lemons, 1958). Both educational programs have experienced substantial changes since their founding. However, both educational systems remain responsible for the dissemination of agricultural information to people, many of which are involved in both organizations because both organizations often exist in the same communities. Similarities are identified in the Smith–Hughes and Smith–Lever Acts regarding the roles of agriculture teachers and Extension personnel. Few have argued that each program approaches their role in educating the people in different ways (formal versus nonformal) both programs nevertheless are types of agricultural educators.

The mere existence of the numerous cooperative agreements and memoranda suggest that states and the federal government have acknowledged that cooperation between the Extension agents and agriculture teachers is important and must be clarified. Despite the importance of this premise, most of the supporting evidence has been drawn from research conducted regarding business and
industry. Kogut (1989) noted, “competitive conflicts disturb the stability of the cooperative agreement” (p. 183). Joint ventures or partnerships are frequently unstable; furthermore, stability can only be promoted by the potential to reciprocate (Kogut, 1989). Mohr and Spekman (1994) suggested that partnerships are formed to achieve a set of goals. Therefore, clarification is necessary to determine appropriate levels of cooperation between agriculture teachers and Extension agents.

The significance of cooperation between secondary agriculture teachers and 4-H youth development personnel is not a new phenomenon and has been noted in many studies (Bruce & Ricketts, 2008; Buddle, 1981; Diatta & Luft, 1986; Grage, Place, & Ricketts, 2004; Lemons, 1958; Omar, 1963; Ricketts & Place, 2005; Smith, 1966). Over a span of time exceeding 70 years, no less than 17 studies have been conducted in at least 13 states regarding the status of cooperation between secondary agriculture teachers and 4-H youth development Extension personnel. These studies have demonstrated that relationships between secondary agriculture educators and 4-H youth development personnel vary among states.

**Theoretical Framework**

A specific theoretical framework directly pertaining to cooperation by secondary agriculture teachers and county Extension personnel does not exist. However, numerous theoretical frameworks related to cooperation (Axelrod, 1984; Barash, 2003; Deutsch, 1958; Johnson & Johnson, 2009; Jones & George, 1998; Poundstone, 1992; West, Tjosvold, & Smith, 2003) may be used to determine the extent of cooperation between the two organizations. For this study the Prisoner’s Dilemma (Axelrod, 1984), a form of game theory, best served as the framework. “Game theory is a study of conflict between thoughtful and potentially deceitful opponents” (Poundstone, 1992, p. 6). Axelrod (1997) suggested, “the Prisoner’s Dilemma is an elegant embodiment of the problem of achieving mutual cooperation, and therefore provides the basis for analysis” (p. 15). Axelrod (1984) noted that continual interaction between the same individuals was imperative. He suggested that the continuing interaction was what allowed for stability in cooperation based on reciprocity.

Axelrod (1984) developed a matrix to demonstrate the possible outcomes of the Prisoner’s Dilemma (see Figure 1). Among two players seeking cooperation, one player is a column player; the other is a row player, both in reference to the position from which they choose. Both players make their choices simultaneously, and unaware of the choice the other player is making. Together, the choices result in one of the four possibilities. If both players cooperate with each other, they will receive the highest outcome. Should the players mutually defect, choosing not to cooperate with each other, they will equally receive a poor outcome. However, should one player cooperate and the other player defect (give–and–take relationship), the player who defects will take all of the reward, leaving the player who cooperated with nothing. Figure 1 illustrates Axelrod’s Prisoners’ Dilemma Payoff concept.

This study utilized the theoretical strategies specific to social cooperation. Axelrod (1984) listed three simple strategies of playing the Prisoner’s Dilemma were observed in his classroom experiments when individuals were unaware of the other individual’s decisions; always defect, always cooperate, and cooperate or defect at random. Poundstone (1992) provided explanation of each of Axelrod’s theoretical strategies. Always defecting was the safest strategy and required constantly taking advantage of the other individual by defecting. Always cooperating offered the greatest advantage to all individuals assuming that all individuals were willing to cooperate all of the time. If an individual were to defect at any time, the cooperating individual would suffer a loss while the defecting individual experienced a greater gain. Cooperating or defecting at random was not a systematic approach to Prisoner’s Dilemma, yet, it was one of Axelrod’s theoretical possibilities. Poundstone acknowledged that the previously stated theoretical strategies were not likely because continual interaction would most likely cause an individual to make changes to their strategy or establish reciprocity.
An additional theoretical strategy was developed as part of a game theory strategy tournament held by Axelrod in 1980 (Poundstone, 1992). “TIT FOR TAT,” also referred to as give–and–take, was developed by Rapoport and is a strategy suggested to work well with human subjects (Axelrod, 1984). Axelrod suggested that “mutual cooperation can be stable if the future is sufficiently important relative to the present” (p. 126). Give–and–take begins with providing the other individual the opportunity to cooperate, then, each individual is given the opportunity to reciprocate that decision by acting according to the previous decision made by the other individual (Poundstone, 1992). A give–and–take relationship can also be set up for exploitation; however, the result will not be as prosperous as mutual cooperation (Axelrod, 1984). To setup a give–and–take relationship for exploitation, individuals must agree to be partners and allow alternation of exploitation. Poundstone suggested that an alternating exploitation of give–and–take operates on a slightly altered version of the golden rule: “Do unto others as you would have them do unto you—or else!” (p. 240).

Deutsch (2003) argued that game theory offered social scientists a quantitative method of determining the mixture of cooperation and competition about conflicts. Deutsch’s theory of cooperation and competition has two premises, one relates to the type of interdependence among goals of the people involved in a given situation, the other pertains to the type of action taken by the people involved (Deutsch, 2000). When there is interdependence, entities will pursue goals in their own self–interest (Tjosvold, West, & Smith, 2003). However, their interaction depends on their belief in how their goals are related and their interaction determines the outcome (Tjosvold, et al., 2003).

Deutsch (2000) proposed two types of goal interdependence: positive and negative. He explained that positive goal interdependence will result in mutual benefit or loss, whereas negative interdependence will result in one person or organization reaping benefit, while the other suffers loss. Deutsch offered a sink or swim analogy to illustrate the differences between positive and negative interdependence. As he described, positive interdependence occurs when entities involved will either swim together (mutually benefiting) or sink together (mutually suffering). Conversely, negative interdependence occurs when one entity swims (independently reaping benefit) while the other entity sinks (independently suffering loss).

### Purpose and Research Objectives

A review of the literature indicated that ambiguity exists regarding cooperative behavior within the findings of similar studies (Boyle, 1958; Bruce & Ricketts, 2008; Bryant, 1965; Buddle, 1981; Diatta & Luft, 1986; Grage, et al., 2004; Lemons, 1958; Omar, 1963; Ricketts & Place, 2005; Schroeder & Moss, 1984; Smith, 1966). Additionally, the studies did not investigate the level and extent of cooperative behavior, nor did they investigate if the cooperation that was present was positively or negatively interdependent. Therefore, the purpose of this study was to describe the perceptions of secondary agriculture teachers and 4-H youth development personnel regarding cooperation using case–scenarios, guided by the following research objectives:
1. Describe the levels of cooperative behaviors (cooperate, give–and–take, defect) secondary agriculture teachers and 4-H youth development Extension personnel exhibit.

2. Describe the cooperative behaviors (cooperate, give–and–take, defect) between secondary agriculture teachers and 4-H youth development Extension personnel as positively or negatively interdependent.

Procedures

As part of a larger study, the research design of this quantitative study was descriptive in nature. The overarching construct of this study was to measure perceptions of secondary agriculture teachers and 4-H youth development personnel in Missouri regarding interorganizational cooperation. The target population for this study was secondary agriculture education teachers and 4-H youth development personnel in Missouri. In the spring of 2008, a simple random sample (Krejcie & Morgan, 1970) of 210 secondary agriculture teachers ($N = 414$) were chosen to participate from the 2007–2008 Missouri Agricultural Education Directory. The University of Missouri Extension Directory of Offices and Employees, included 108 4-H youth specialists, 4-H youth educators, 4-H youth associates, or 4-H youth assistants who were employed by the University Extension at the time that the Directory was accessed. State–level 4-H youth specialists were excluded from the study because their professional responsibilities to the entire state would presumably not allow them opportunities to exercise cooperative behaviors in the same capacity as regional and county Extension personnel. Due to the relatively small number of subjects, a census ($N = 91$) was taken to more accurately describe the characteristics of the population and eliminate potential errors associated with subject selection and sampling.

The data collection instrument used in this study was researcher developed for a larger study. The portion of the instrument related to the objectives of this study sought to measure each subjects’ cooperative behavior using context specific, case–scenarios. Two case–scenarios were developed to determine the type of cooperative behavior (cooperate, give–and–take, or defect) subjects would demonstrate if they were in each case–scenario situation. Specifically, the case–scenarios were selected to determine how available resources directly affect levels of cooperation. For each case–scenario, four six–point summated rating scale responses (1 = Not Likely to 6 = Very Likely), were provided to gauge each subject’s willingness to cooperate in relation to the Prisoner’s Dilemma matrix.

In similar studies (Bryant, 1965; Grage, et al., 2004), competition at county fairs was noted as often being an influential factor in determining the level of cooperation between agriculture teachers and Extension agents. Hence, the first case–scenario was developed to depict a hypothetical situation at a fictitious county fair. The following context specific case–scenarios were presented to secondary agriculture teachers and 4-H youth development personnel in their respective questionnaire. The first case–scenario described a junior livestock auction at a county fair and asked subjects to respond to the fair board requesting the subjects’ input on sale order.

Scenario 1, Context: County Fair

The sale order of the Junior Livestock Auction at the county fair is under review by the fair board. The fair board has decided to review the sale order policy because the sale prices are higher at the beginning of the auction when most of the buyers are present and have the most money to spend. You know that the prices at the beginning of the sale are much higher, but it has been a long–time tradition that FFA members are first in the sale order, followed by the 4-H members. The fair board has asked for your input.

The sale order of the Junior Livestock Auction at the county fair is under review by the fair board. The fair board has decided to review the sale order policy because the sale prices are higher at the beginning of the auction when most of the buyers are present and have the most money to spend. You know that the prices at the beginning of the sale are much higher, but it has been a long–time tradition that 4-H members are first in the sale order, followed by the 4-H members. The fair board has asked for your input.
Previous studies (Buddle, 1981; Grage, et al., 2004; Schroeder & Moss, 1984; Smith, 1966) suggested that cooperation might be affected when resources such as facilities are a factor. Therefore, the second case–scenario was developed to depict a hypothetical situation regarding donated facilities. The second case–scenario described a 20 acre farm that was donated to the subjects’ counterpart’s program (high school agricultural education department or county Extension office) and asked each subject to determine the extent to which they would be willing to help their counterpart. The following context specific case–scenarios were presented to secondary agriculture teachers’ and 4-H youth development personnel’s roles to determine the level of cooperation they would exhibit when serving as youth educators.

Scenario 2, Context: Donated Land Laboratory

The county Extension agent has received a donation of a nearby 20–acre farm. Prior to being donated to the County Extension Office, the farm was vacant for a year. The barn is in good condition, but it needs a coat of paint, the fences around the pasture need mending, and some of the boards on the corrals need to be replaced. The Extension agent and her 4-H members do not have the tools or equipment to repair the farm so she has approached you. Your school does have all of the necessary tools and equipment, and you have enough FFA members with the experience necessary to safely use them.

The high school agriculture teacher has received a donation of a nearby 20–acre farm. Prior to being donated to the high school agricultural education program, the farm was vacant for a year. The barn is in good condition, but it needs a coat of paint, the fences around the pasture need mending, and some of the boards on the corrals need to be replaced. The agriculture teacher and her FFA members do not have the tools or equipment to repair the farm so she has approached you. Between the Extension office and your volunteers, you have all of the necessary tools and equipment, as well as enough 4-H members and volunteers with the experience necessary to safely use them.

This study implemented a mixed–mode design as referenced by Dillman (2007) by providing subjects with a mailed questionnaire, followed by an electronic questionnaire in the sequence order suggested by Converse, Wolfe, Huang, and Oswald (2008). Providing subjects with the option of choosing which mode of responding had shown to have little effect on the response rate (Converse, et al., 2008). Therefore, all correspondence sent to subjects, with the exception of the cover letter in the first mail questionnaire packet, included both options of responding: by mail questionnaire or a Web–based electronic questionnaire.

Dillman (2007) suggested that self–administered questionnaires be constructed in an easy to understand and answer manner. Therefore, to address the potential issue of clarity for each population (secondary agriculture teachers and 4-H youth development personnel), two versions of the questionnaire were developed. The questionnaires were near identical in format and construction; however, each case–scenario and question was reworded to apply to the subject receiving the questionnaire to avoid confusion.

Face validity and content validity of the data collection instrument were determined by a panel of eight experts: four of whom were faculty members from the University of Missouri, Department of Agricultural Education and four faculty members from the University of Missouri Extension Service. Dillman’s (2007) unimode construction principles were followed when creating the electronic version of the questionnaire to reduce the possibility of inconsistencies in responses due to mixed–mode data collection. The electronic version of the questionnaire was created and distributed to the same panel of experts using Web–hosted software provided by Hosted Survey™ to reassess face validity of the instrument in its electronic form.

The reliability of the instrument was determined by conducting a pilot test using individuals with similar characteristics of secondary agriculture teachers in the sample population and the 4-H youth development personnel. In this case, secondary agriculture teachers not selected to comprise the sample (n = 204) and 4-H agents in the neighboring state of Kansas. The electronic version of the secondary agriculture teacher questionnaire was distributed by e–mail using the Hosted Survey™ software. Reliability of each instrument was
determined using the same statistical methods for both versions of the instrument. The two case–scenarios could be described as non–summable items; therefore, a test–retest method of determining reliability was utilized. Twenty–nine (69%) responses were received from the agriculture teachers and 32 (78%) responses were received from the Kansas 4-H agents who were invited to participate in the second administration of the case–scenario section of the questionnaire. SPSS® version 15.0 for Windows™ platform computers was used to determine the coefficient of stability by comparing the responses from the initial administration to the responses from the second administration (see Table 1).

Table 1
Test–Retest Measures of Reliability for Secondary Agriculture Teacher Questionnaire (n = 29) and 4-H Youth Development Personnel Questionnaire (n = 25)

<table>
<thead>
<tr>
<th>Case–Scenario</th>
<th>Question 1</th>
<th>Question 2</th>
<th>Question 3</th>
<th>Question 4</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Scenario 1: County Fair</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Secondary Agriculture Teachers</td>
<td>0.83</td>
<td>0.73</td>
<td>0.77</td>
<td>0.72</td>
</tr>
<tr>
<td>4-H Youth Development Personnel</td>
<td>0.96</td>
<td>0.83</td>
<td>0.82</td>
<td>0.88</td>
</tr>
<tr>
<td><strong>Scenario 2: Land Lab</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Secondary Agriculture Teachers</td>
<td>0.95</td>
<td>0.88</td>
<td>0.95</td>
<td>0.82</td>
</tr>
<tr>
<td>4-H Youth Development Personnel</td>
<td>0.88</td>
<td>0.83</td>
<td>0.93</td>
<td>0.93</td>
</tr>
</tbody>
</table>

This study followed the data collection protocol suggested by Dillman (2007). However, the communication medium suggested by Converse et al. (2008) deviated from the methods described by Dillman, primarily in the medium used to correspond with and provide questionnaires to respondents and nonrespondents. The first mail questionnaire packet included one cover letter, one paper questionnaire with a $1 incentive attached to the cover of the booklet–type paper questionnaire, and one pre–addressed envelope with a first–class stamp pre–applied to the envelope. An e–mail reminder was sent to all secondary agriculture teachers and 4-H youth development personnel who had not yet responded, six days after the first mail–questionnaire packets were mailed. An additional complete e–mail message containing a link to the Web–based electronic questionnaire was sent to nonrespondents six days after the previous reminder message was sent. A response rate of 65% (n = 136) was obtained for secondary agriculture teachers; whereas, the response rate for 4-H youth development personnel was 73% (n = 66).

Non–response error was a relevant concern; therefore, procedures for handling nonrespondents were followed as outlined in Miller and Smith (1983). A list of secondary agriculture teacher nonrespondents was compiled and a simple random sample of 25% of nonrespondents was taken from the list. An additional questionnaire packet was assembled and sent to the nonrespondent sample (n = 20) of secondary agriculture teachers, followed by two more points of contact. Seven days after the second mail questionnaire packets were mailed, an additional e–mail reminder was sent to each of the agriculture teachers who had not yet responded in an effort to maximize response rate. Twenty 4-H youth development personnel had not responded seven days after the second complete e–mail was sent. Due to the relatively high response rate of the initial data collection attempt, 4-H youth development personnel who had not yet responded were determined to be nonrespondents and were sent an additional mail questionnaire packet. The content, format, and construction of the paper questionnaire were unaltered; however, no incentive was included in the second packet.

Respondent data from each paper questionnaire were manually entered into a Microsoft Excel spreadsheet, whereas, respondent data from each electronic questionnaire were downloaded from the Hosted Survey™ website in a .txt form document, and then imported into to a Microsoft Excel spreadsheet. Data were analyzed using SPSS® version 15.0 for Windows™ platform computers. In determining the appropriate analysis of the data, the primary guidance was
scales of measurement as outlined by Ary, Jacobs, Razavieh, and Sorensen (2006).

Respondent and nonrespondent data were compared using an independent samples $t$-test to compare the variables of interest—cooperate, give–and–take, defect—between respondents and nonrespondents. No significant differences ($p > .05$) existed between respondent and nonrespondent data for secondary agriculture teachers or 4-H youth development personnel. Hence, the nonrespondent data were pooled with respondent data yielding a 69% ($n = 143$) secondary agriculture teachers and 82% ($n = 75$) 4-H youth development personnel.

**Findings**

The findings presented were part of a larger study undertaken to determine the perceptions of cooperation between secondary agriculture teachers and 4-H youth development personnel. The first research objective sought to determine which levels of cooperative behavior—cooperate, give–and–take, defect—secondary agriculture teachers and 4-H youth development personnel exhibit. Data from each six–point summed rating scale question (1 = Not Likely; 6 = Very Likely) related to case–scenario one were collapsed into dichotomous groupings (1, 2, 3 = Not Likely and 4, 5, 6 = Likely). The relative similarity of the summed likely percentages of secondary agriculture teachers and 4-H youth development personnel are illustrated in Figure 2. Secondary agriculture teachers and 4-H youth development personnel are far more likely to choose a give–and–take level of cooperation, indicating a give–and–take relationship, than they are to cooperate or defect. Furthermore, differences existed in levels of cooperative behavior relative to the option of giving first (TIT FOR TAT 1°) in a give–and–take relationship versus giving second (TIT FOR TAT 2°).

![Figure 2](image)

*Figure 2.* Levels of likelihood of cooperative behavior of secondary agriculture teachers and 4-H youth development personnel in a competitive situation.

Frequency and percentages for each level of cooperative behavior (cooperate, give–and–take, and defect) of secondary agriculture teachers (see Table 2) and 4-H youth development personnel (see Table 3) based on the Prisoner’s Dilemma in regard to the county fair case scenario are reported.
Table 4

*Agriculture Teachers’ Cooperative Behavior, Case Study Scenario 1 – County Fair (n = 143)*

<table>
<thead>
<tr>
<th>Behavior</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cooperate</td>
<td>70</td>
<td>49.0</td>
<td>27</td>
<td>18.9</td>
<td>27</td>
<td>18.9</td>
</tr>
<tr>
<td></td>
<td>12</td>
<td>8.3</td>
<td>5</td>
<td>3.5</td>
<td>2</td>
<td>1.4</td>
</tr>
<tr>
<td>Tit for Tat 1°</td>
<td>32</td>
<td>22.4</td>
<td>9</td>
<td>6.3</td>
<td>15</td>
<td>10.5</td>
</tr>
<tr>
<td></td>
<td>17</td>
<td>11.9</td>
<td>29</td>
<td>20.3</td>
<td>41</td>
<td>28.7</td>
</tr>
<tr>
<td>Tit for Tat 2°</td>
<td>11</td>
<td>7.7</td>
<td>5</td>
<td>3.5</td>
<td>7</td>
<td>4.9</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>7.0</td>
<td>31</td>
<td>21.7</td>
<td>79</td>
<td>55.2</td>
</tr>
<tr>
<td>Defect</td>
<td>56</td>
<td>39.2</td>
<td>40</td>
<td>28.0</td>
<td>25</td>
<td>17.5</td>
</tr>
<tr>
<td></td>
<td>12</td>
<td>8.2</td>
<td>11</td>
<td>7.7</td>
<td>7</td>
<td>4.9</td>
</tr>
</tbody>
</table>

*Note.* Tit for Tat 1° = give first; Tit for Tat 2° = give second

Table 5

*4-H Youth Development Personnel’s Cooperative Behavior, Case Study Scenario 1 – County Fair (n = 73)*

<table>
<thead>
<tr>
<th>Behavior:</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cooperate</td>
<td>35</td>
<td>47.9</td>
<td>13</td>
<td>17.8</td>
<td>10</td>
<td>13.7</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>8.2</td>
<td>4</td>
<td>5.5</td>
<td>5</td>
<td>6.8</td>
</tr>
<tr>
<td>Tit for Tat 1°</td>
<td>18</td>
<td>24.7</td>
<td>2</td>
<td>8.2</td>
<td>9</td>
<td>12.3</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>8.2</td>
<td>10</td>
<td>13.7</td>
<td>24</td>
<td>32.9</td>
</tr>
<tr>
<td>Tit for Tat 2°</td>
<td>3</td>
<td>4.1</td>
<td>0</td>
<td>0.0</td>
<td>5</td>
<td>6.8</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>5.5</td>
<td>16</td>
<td>21.9</td>
<td>45</td>
<td>61.6</td>
</tr>
<tr>
<td>Defect</td>
<td>42</td>
<td>58.3</td>
<td>14</td>
<td>19.4</td>
<td>6</td>
<td>8.3</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>9.7</td>
<td>1</td>
<td>1.4</td>
<td>2</td>
<td>2.8</td>
</tr>
</tbody>
</table>

*Note.* Tit for Tat 1° = give first; Tit for Tat 2° = give second

The data from each six–point summated rating scale question (1 = Not Likely; 6 = Very Likely) related to the land laboratory case–scenario were collapsed into dichotomous groupings (1, 2, 3 = Not Likely and 4, 5, 6 = Likely). Secondary agriculture teachers and 4-H youth development personnel were more likely to choose the cooperate level of cooperative behavior when they are giving second (TIT FOR TAT 2°). Nevertheless, all three levels of cooperation in regard to the Prisoner’s Dilemma—cooperate, give–and–take, defect—were present. The similar summed likely percentages of secondary agriculture teachers and 4-H youth development personnel are illustrated in Figure 3.
Frequency and percentages for each level of cooperative behavior—cooperate, give–and–take, defect—of secondary agriculture teachers (see Table 3) and 4-H youth development personnel (see Table 4) based on the Prisoner’s Dilemma in regard to the county fair case–scenario are reported.

Table 3
Agriculture Teachers’ Cooperative Behavior Case Study Scenario 2 – Land Lab (n = 143)

<table>
<thead>
<tr>
<th>Behavior</th>
<th>Not Likely 1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>Very Likely 6</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>f</td>
<td>%</td>
<td>f</td>
<td>%</td>
<td>f</td>
<td>%</td>
</tr>
<tr>
<td>Cooperate</td>
<td>2</td>
<td>1.4</td>
<td>5</td>
<td>3.5</td>
<td>14</td>
<td>9.9</td>
</tr>
<tr>
<td>Tit for Tat 1°</td>
<td>40</td>
<td>28.2</td>
<td>55</td>
<td>38.7</td>
<td>17</td>
<td>12.0</td>
</tr>
<tr>
<td>Tit for Tat 2°</td>
<td>3</td>
<td>2.1</td>
<td>3</td>
<td>2.1</td>
<td>5</td>
<td>3.5</td>
</tr>
<tr>
<td>Defect</td>
<td>78</td>
<td>54.9</td>
<td>45</td>
<td>31.7</td>
<td>9</td>
<td>6.3</td>
</tr>
</tbody>
</table>

Note. Tit for Tat 1° = give first; Tit for Tat 2° = give second
Table 4
4-H Youth Development Personnel’s Cooperative Behavior, Case Study Scenario 2 – Land Lab (n = 74)

<table>
<thead>
<tr>
<th>Likelihood</th>
<th>Not Likely</th>
<th>Very Likely</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td><strong>Behavior:</strong></td>
<td>f</td>
<td>%</td>
</tr>
<tr>
<td>Cooperate</td>
<td>4</td>
<td>5.4</td>
</tr>
<tr>
<td>Tit for Tat 1°</td>
<td>20</td>
<td>27.4</td>
</tr>
<tr>
<td>Tit for Tat 2°</td>
<td>2</td>
<td>2.7</td>
</tr>
<tr>
<td>Defect</td>
<td>54</td>
<td>73.0</td>
</tr>
</tbody>
</table>

Note. Tit for Tat 1° = give first; Tit for Tat 2° = give second

Secondary agriculture teachers and 4-H youth development personnel exhibited all three levels of cooperation—cooperate, give-and-take, defect—in relation to the Prisoner’s Dilemma matrix. Responses to the two case-scenarios indicated levels of cooperation varied depending on the context of the situation. Cooperation was more likely to occur at the give-and-take level when competition was a factor (e.g. scenario 1); whereas, secondary agriculture teachers and 4-H youth development personnel were more likely to cooperate when nonmonetary resources were a factor (e.g. scenario 2). Additionally, in each of the summed likely figures, interdependence was depicted as positive based on the greater presence of cooperative and give-and-take tendencies.

Conclusions, Implications, Recommendations

Secondary agriculture teachers and 4-H youth development personnel may not be aware that both groups are receptive to participating in all levels of cooperative relationships: cooperate, give-and-take, and defect. The existence or absence of competition may shift the level of cooperation to or from pure cooperation. In addition, the cooperative behaviors of secondary agriculture teachers may be affected by the resources at stake in each situation, thereby affecting whether interdependence is positive or negative. This study investigated two context-specific case-scenarios; give-and-take relationships may exist in other contexts as well. A give-and-take relationship is mutually beneficial for secondary agriculture teachers and 4-H youth development personnel; however, the allocation of resources appeared to have some effect on cooperative behavior. If both groups are not aware that they were willing to engage in this type of relationship the likelihood of each group initiating the reciprocal relationship is reduced.

Secondary agriculture teachers and 4-H youth development personnel would benefit from the formation of a joint advisory committee of representatives from each organization, including administrators, to formulate a cooperative plan of action and create a list of suggested ways that secondary agriculture teachers and 4-H youth development personnel can interact through joint activities. Stimson (1920) suggested that conferences or committees were necessary to coordinate efforts of the federally funded agencies providing agricultural education in order to avoid overlapping and overlooking. “Good teamwork could hardly be expected in the absence of such conferences” (Stimson, 1920, p. 359). Following the spirit of Stimson’s suggestions, a professional development conference should be organized by the University of Missouri Extension administration and the Missouri Department of Elementary and Secondary Education, and held annually.

The necessity to share resources would seem obvious. Bender, Cunningham, McCormick, Wolf, and Woodin (1972) suggested that, “the kind and extent of physical facilities and instructional materials available—including community resources—affect the methods of teaching that can and should be used” (p. 29). Secondary agriculture teachers should consider the resources available in the community, such as farms, greenhouses, and agriculture-related
businesses, to supplement the curriculum and use as potential laboratories (Bender, et al., 1972). Additionally, this study did not investigate whether secondary agriculture teachers and 4-H youth development personnel considered the members of their organizations to be a resource. Further research should be conducted to determine if membership is considered a resource for each organization, particularly in small communities.

Youth members of 4-H clubs and FFA chapters alike frequently look to their leaders and advisers to serve as role models. What message are secondary agriculture teachers and 4-H youth development personnel sending to the youth of their organizations if they are not able to set the example by cooperating with each other, openly communicating, or share resources? Secondary agriculture teachers and 4-H youth development personnel must be mindful that the youth development activities that they are responsible for should begin to develop beneficial skills that youth will carry with them into adulthood.

Further research may be appropriate to determine if including other youth development organizations, such as Boy Scouts and Girl Scouts of America in joint youth development activities with 4-H and FFA would further benefit the youth members of the organizations.

A reciprocal give-and-take cooperative relationship appears to be acceptable to 4-H youth development personnel; however, it is still unclear as to how they should begin to stabilize such a relationship with secondary agriculture teachers. An even more perplexing question is: Who will have to give first in order for the other group to reciprocate, to eventually establish a mutually beneficial reciprocal give-and-take cooperative relationship?

References


Bryant, B., Jr. (1965). *A Study of opinions and attitudes expressed by county extension and vocational agriculture teachers in Oklahoma regarding the nature and extent of desirable cooperative working relationships* (Unpublished master's thesis). Oklahoma State University, Stillwater, OK.


Smith, W. L. (1966). *An examination of the cooperative cognation between vocational agriculture instructors and county extension agents in planning and conducting the adult prospectus of instruction in Oklahoma* (Unpublished master's thesis). Oklahoma State University, Stillwater, OK.


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

ROBERT M. TORRES is a Professor & Department Head in the Department of Agricultural Education at the University of Arizona, 205 Old FCS Building, Tucson Arizona, AZ, 85721, rtorres@CALS.arizona.edu
Early Career Agriculture Teachers’ Efficacy Toward Teaching Students with Special Needs

Mollie S. Aschenbrener, Instructor
California State University, Chico
Bryan L. Garton, Professor and Associate Dean
University of Missouri
Amanda L. Ross, Agriculture Instructor
Salisbury High School

This study sought to assess the perceptions of early career agriculture teachers’ ability to teach students with special needs. Agriculture teachers in the first five years of their careers indicated that administrative support contributed the most to their success in working with students with special needs, while in–service activities that focused on students with special needs contributed little. Self–efficacy was the strongest predictor of self–perceived success of teaching students with special needs. Self–efficacy, combined with administrator support, in–service and teacher preparation, accounted for 27% of the variance in early career agriculture teachers’ self–perceived success of teaching students with special needs.

Keywords: teacher efficacy, teaching students with special needs

Introduction

Mainstreaming of students with special needs has been mandated since 1975 when legislation specified students should be educated in the least restrictive environment (Treder, Morse, & Ferron, 2000). The Education for all Handicapped Children Act, now known as the Individuals with Disabilities Education Act (Public law 94–142), addressed students with special needs. Students with special needs battle not only the normal challenges associated with adolescence, but also the ones created by their individual disabilities (Lerner, 2003). Students with special needs often possess personal characteristics that make learning difficult and teaching a challenge. To compound these issues, students with special needs may lack the attention span necessary for a majority of secondary classes. Although subject specific teachers receive preparation on teaching adolescent children, they may not acquire teaching strategies and techniques for specific learning deficits of students with special needs (Mims, Harper, Armstrong, & Savage, 1991).

Regardless of the teaching method, most students with special needs will need modifications and/or adaptations (Mastropieri & Scruggs, 1995). Individualized Education Plans (IEPs) provide teachers with clear statements on the type of modifications and services the student with special needs should receive (Algozzine, Ysseldyke, & Campbell, 1994). Subject specific teachers must recognize their role in implementing IEPs (Sharpe & Hawes, 2003). However, this is often challenging, as instructions on each plan “represent philosophies of what should be taught rather than illustrations of how it should happen” (Algozzine et al., p. 34).

Students with special needs have been the topic of research in agricultural education (Elbert & Baggett, 2003; Kessell et al., 2006a, 2006b). Secondary agriculture instructors experience a number of challenges when students with special needs are incorporated into their classroom (Elbert & Baggett, 2003). Modifications required for special needs students can become even more challenging in technical classes. Special education teachers
often have limited experience working in technical classrooms, making it challenging for them to assist technical teachers (Evers & Bursuck, 1995). In addition, safety can be a concern in technical laboratory courses. Some students with special needs become overwhelmed when they are required to complete tasks that involve numerous steps and specialized equipment. These students could find class and individual projects difficult and often will work much slower than their peers (Campbell & Olsen, 1994). Evers & Bursuck found students with special needs enrolled in career and technical education classes experience challenges similar to those in “core” academic subjects. Consequently, agriculture teachers may teach students with special needs who face academic and technical challenges. However, how do secondary agriculture teachers perceive their ability to teach and meet the educational needs of students with special needs? What factors contribute to their feeling of efficacy toward working with these students?

Theoretical Framework

Self-efficacy describes a person’s confidence in his or her ability to accomplish tasks in a specific domain. In addition, self-efficacy influences a person’s acquisition of specific skill development and demonstration of behaviors related to that domain (Bandura, 1997; Ormrod, 2004). Further, self-efficacy is the connection between knowledge and action that is a strong determinant in an individual’s accomplishments (Plourde, 2002; Soto & Goetz, 1998). Those who doubt their capability in a particular domain will often shy away from the difficult task in that domain (Bandura, 1997). Low self-efficacy leads one to believe situations are more difficult than they really are and promotes an increase in stress and depression (Soto & Goetz, 1998). A teacher’s self-efficacy can impact his/her teaching and ultimately student learning.

The perceived efficacy of teachers has been the topic of considerable research (Ashton & Webb, 1986; Bandura, 1997; Brownell & Pajares, 1999). Teacher efficacy is the conviction held by the teacher that the desired learning outcome could be achieved (Soto & Goetz, 1998). A high personal teaching efficacy indicates teachers’ confidence in their ability to make a difference with students (DiBella-McCarthy, McDaniel, & Miller, 1995). A teacher with a high sense of self-efficacy will devote more time to academic pursuits and provide students the guidance they need to succeed (Bandura, 1997). Classroom practices, such as praise instead of criticism, enthusiasm, and acceptance of students’ opinions are influenced by the level of teacher efficacy (Soto & Goetz, 1998). Colardarci (1994) found teaching efficacy was the greatest predictor of a teacher’s commitment to the profession. Further, Midgley, Feldlaufer, and Eccles (1989) concluded students’ achievement and attitude toward learning were affected by the level of their teacher’s efficacy. Students of efficacious teachers believed they were performing better and the subject was less difficult than those students who had teachers with low levels of efficacy. Not surprisingly, both discipline specific and special education teachers with a high sense of teacher efficacy are more likely to recommend a student with special needs be placed in a regular classroom than a teacher with low teacher efficacy (Soodak & Podell, 1993).

Raundenbush, Rowan, and Cheong (1992) investigated 315 high school teachers in an attempt to identify predictors of teacher efficacy. They found vocational and discipline specific teachers were less efficacious than teachers instructing honors classes. While academic achievement has been found to play a role in teacher efficacy, Watson (2006) did not find a relationship between teachers’ years of experience and their level of efficacy. Brownell and Pajares (1999) described factors affecting a teacher’s self-efficacy when working with students with disabilities. These factors included pre-service preparation, in-service participation, and administrative support (Figure 1).
Regarding pre-service teacher preparation, the student teaching experience places a student in a teaching/learning setting under the supervision of a university supervisor and an experienced teacher. This field-based learning experience provides an opportunity for modeling to occur. According to Bandura (1997), a person’s self-efficacy can be enhanced through modeling and “seeing or visualizing people similar to oneself perform successfully typically raises efficacy beliefs” (p. 87). In addition, Brownell and Pajares (1999) found the pre-service experience to be a direct indicator of a teacher’s self-efficacy and self-perceived success when working with students with special needs. Student teachers who developed a high sense of self-efficacy have been shown to behave in a manner that made them more efficacious teachers (Plourde, 2002). Interestingly, teachers prepared in teacher education programs have been suggested to feel significantly more prepared than those who choose alternative certification programs (Darling-Hammond, Chung, & Frelow, 2002). In addition, teachers’ opinion of their preparedness varies and this level of preparedness was significantly correlated with their self-efficacy. The self-efficacy of teachers, including student teachers, has also been the subject of research in subject specific areas such as agricultural education (Joerger & Boettcher, 2000; Knobloch & Whittington, 2002, 2003).

Knobloch and Whittington (2002) found teacher preparation quality, collective efficacy, and student teaching experience were associated with teacher efficacy of novice and student teachers. In addition, results suggested student teachers and novice teachers may need to believe they contribute to an efficacious group of teachers. Self-confidence and personal satisfaction has been show to impact teaching of beginning agriculture teachers (Joerger & Boettcher, 2000). Knobloch and Whittington (2003) found pre-service and novice teachers possessing a greater commitment to their careers were more efficacious after applied teaching experiences in the classroom. More specifically, early teaching experiences may determine commitment to the teaching profession and contributes to helping students learn and develop (Knobloch & Whittington, 2003).

In-service education enhances teachers’ knowledge and skills in an effort to improve their effectiveness (Garton & Chung, 1996) and provides opportunities to improve their teaching abilities (Telljohann, Everett, Durgin, & Price, 1996). Research indicates in-service participation increases the self-efficacy of teachers (Telljohann et. al., 1996; Watson, 2006). Not surprisingly, in-service participation...
was found to directly affect a teacher’s self-efficacy and self-perceived success when working with students with special needs (Brownell & Pajares, 1999).

One factor in a teacher’s commitment to the profession is the educational leadership and support of school administration (Colardarci, 1994). Brownell & Pajares (1999) suggested supportive administrators increase teacher’s efficacious beliefs, which may increase teacher perseverance (Bandura, 1997).

Administrative support may help agriculture teachers include students with special needs into secondary agriculture classes. Elbert and Baggett (2003) suggested agriculture teachers need increased training to teach students with special needs, which can be provided by administrators (Elbert & Baggett, 2003). Although the hands-on nature of agriculture courses may allow secondary agriculture teachers to accommodate students with special needs, teachers do not always possess the desired competence for special needs instruction (Elbert & Baggett). Although secondary agriculture teachers face the challenge of teaching students with special needs and diverse student learners, do these teachers feel prepared to teach students with special needs? While self-efficacy suggests the level of confidence teachers hold in their ability to teach students with special needs, self-perceived success suggests the level of success teachers have experienced while working with students with special needs. Do teacher efficacy levels suggest secondary agriculture teachers are more successful in teaching students with special needs? Addressing these questions may shed light on a topic with limited research in agricultural education.

**Purpose and Research Objectives**

The purpose of this study was to determine early career teachers’ self-perceptions of their teacher preparation program, professional in-service experience and administrator support toward working with students with special needs. In addition, this research sought to explain the variance in the self-perceived success in working with students with special needs of early career agriculture teachers in Missouri. The following research objectives guided the study:

1. Describe the personal and professional characteristics of teachers (age, sex, teaching experience, teacher licensure, and level of education).
2. Assess teachers’ self-perception of their teacher preparation program, in-service participation, and administrator’s general support toward working with students with special needs.
3. Describe teacher efficacy toward the competencies necessary for working with students with special needs.
4. Describe the self-perceived success of teachers when working with students with special needs.
5. Explain the variance in self-perceived success of working with students with special needs accounted for by teacher efficacy while controlling for teacher preparation, administrative support, and in-service participation.

**Methods and Procedures**

The population of all early career agriculture teachers in Missouri was utilized (N = 123) for this study. The frame was developed using the 2006–07 State Agricultural Education Directory. Early career teachers were identified as teachers with five or less years of teaching experience. However, the population was considered representative of past and future populations of early career agriculture teachers. According to Oliver and Hinkle (1982), this justified the use of a time and place sample. The time and place sample resulted in 123 secondary instructors who met the criteria. Because all members of the population were included in the study, sampling procedures were not imposed. As a result, the threat of sampling error was not a consideration in this study.

The data collection instrument was a modified version of *Working with Diverse Students: The General Educator’s Perspective* (Brownell & Pajares, 1999). Modification of the instrument removed only demographic questions not pertinent to the purpose of this study. The questionnaire was validated through prior research (Morvant & Gersten, 1995; Rosenholtz, 1989) and was assessed for reliability (Brownell & Pajares, 1999). Cronbach’s alpha coefficients were reported for each section of the questionnaire and ranged from .81 to .96. A post
hoc Cronbach’s alpha for this study was found to be .93.

The questionnaire was administered through an on-line survey tool. Teachers received an invitation to participate in the study and the survey link through electronic mail. After three follow-up requests, as recommended by Dillman (2007), 81 of the 123 (66%) teachers returned useable questionnaires.

Non response error was addressed by comparing on-time and late respondents for statistical differences (Miller & Smith, 1983; Ary, Jacobs, & Razavieh, 2002). Late respondents were considered those who responded following a third request to complete the on-line instrument. The variances were assumed equal after calculating Levene’s test for equality of variances ($p > .05$). Independent samples $t$-tests showed no significant difference between on-time ($n = 48$) and late respondents ($n = 25$) for teacher preparation ($t = .04; p > .05$), in-service ($t = –1.65; p > .05$), administrative support ($t = –1.76; p > .05$), self-efficacy ($t = –1.82 p > .05$) and perceived success ($t = –.02; p > .05$).

Descriptive statistics were used to simplify and characterize the data. Pearson product correlation coefficients were calculated between variables and interpreted using Bartz’s (1999) descriptors. Hierarchical multiple linear regression was used to explain the variance in early career agriculture teachers’ self-perceived success of working with students with special needs, while controlling for the variables of interest. Prior to conducting the regression analysis bivariate correlations between the three control variables were calculated to reveal the presence of multicollinearity, a potential violation of the assumptions in using multiple linear regression. Following guidelines offered by Berry and Feldman (1985), none of the bivariate correlations approached the threshold of .80; therefore, were not considered threats to multicollinearity and remained in the analysis.

**Results and Findings**

The purpose of the first research objective was to describe the personal and professional characteristics of teachers. The respondents were found to be equally split between male ($n = 42$) and female ($n = 39$) (see Table 1). In addition, the most frequent level of education was found to be a bachelor’s degree. On average, respondents had 2.71 years of teaching experience ($SD = 1.48$) and were approximately 26 years of age ($SD = 4.02$), ranging from 22 to 48.

The second research objective sought to assess teachers’ self-perception of their teacher preparation program, in-service participation, and administrator’s general support toward working with students with special needs. Early career agriculture teachers’ overall (summed) assessment of their pre-service coursework regarding working with students with special needs was $3.57$ ($SD = 1.22$) (see Table 2). Knowledge of the different needs of students with disabilities was the highest rated individual item ($M = 3.78, SD = 1.30$), while the lowest was the ability to adapt curriculum for students with disabilities ($M = 3.33, SD = 1.36$).

<table>
<thead>
<tr>
<th>Table 1</th>
<th><strong>Demographic Characteristics of Early Career Agriculture Teachers (n = 81)</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Construct Items:</strong></td>
<td><strong>F</strong></td>
</tr>
<tr>
<td>Age</td>
<td>26.08</td>
</tr>
<tr>
<td>Years of Teaching</td>
<td>2.71</td>
</tr>
<tr>
<td>Sex</td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>39</td>
</tr>
<tr>
<td>Male</td>
<td>42</td>
</tr>
<tr>
<td>Teacher Licensure</td>
<td></td>
</tr>
<tr>
<td>University preparation</td>
<td>77</td>
</tr>
<tr>
<td>Temporary certificate</td>
<td>4</td>
</tr>
<tr>
<td>Educational Level</td>
<td></td>
</tr>
<tr>
<td>Bachelors</td>
<td>65</td>
</tr>
<tr>
<td>Masters</td>
<td>16</td>
</tr>
</tbody>
</table>
Table 2
Assessment of Teacher Preparation Concerning Working with Students with Special Needs (n = 81)

<table>
<thead>
<tr>
<th>Construct Items</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge of different needs of students with disabilities.</td>
<td>3.78</td>
<td>1.30</td>
</tr>
<tr>
<td>Ability to adapt curriculum for students with disabilities.</td>
<td>3.60</td>
<td>1.39</td>
</tr>
<tr>
<td>Ability to adapt instruction for students with disabilities.</td>
<td>3.58</td>
<td>1.37</td>
</tr>
<tr>
<td>Ability to manage behavioral difficulties of students with disabilities.</td>
<td>3.33</td>
<td>1.36</td>
</tr>
<tr>
<td>Teacher Preparation (Summated Score)</td>
<td>3.57</td>
<td>1.22</td>
</tr>
</tbody>
</table>

Note. Scale: 1 = disagree, 6 = agree

Descriptive statistics were calculated for perceptions of special needs in-service participation for the items that comprised the construct, followed by a summated score. The overall assessment of the in-service available for early career agriculture teachers was 3.36 (SD = 1.45) (see Table 3). With an average of 3.48 (SD = 1.54), in-service programs that focused on the needs of students with disabilities had the highest level of participation. Special education in-services had the least participation (M = 3.22, SD = 1.51).

Table 3
Participation in In-Service Concerning Working with Students with Special Needs (n = 81)

<table>
<thead>
<tr>
<th>Construct Items</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>The needs of students with disabilities.</td>
<td>3.48</td>
<td>1.54</td>
</tr>
<tr>
<td>Adapting instruction for students with disabilities.</td>
<td>3.35</td>
<td>1.55</td>
</tr>
<tr>
<td>Managing behavioral difficulties of students with disabilities.</td>
<td>3.35</td>
<td>1.50</td>
</tr>
<tr>
<td>Adapting curriculum for students with disabilities.</td>
<td>3.22</td>
<td>1.51</td>
</tr>
<tr>
<td>Special Needs In-Service (Summated Score)</td>
<td>3.36</td>
<td>1.45</td>
</tr>
</tbody>
</table>

Note. Scale: 1 = disagree, 6 = agree

The summated score for general administrative support was 4.66 (SD = 1.16) (see Table 4). With a mean score of 5.10 (SD = 1.22), the administrator “supports me in my interaction with parents” was the highest rated individual item. Ranking the lowest of the individual items was “assist general educators in successfully including students with disabilities in the mainstream” (M = 4.36, SD = 1.45).
Research objective three sought to determine the teacher efficacy of early career agriculture teachers toward working with students with special needs. Teachers were asked to respond to the question, “considering your current instructional situation and teaching responsibilities, how much can you do to...?” The teacher efficacy of agriculture teachers’ summated score was 4.31 (SD = .72) (see Table 5). The individual indicator of self–efficacy that ranked the highest was “manage disruptive behavior in the classroom,” (M = 4.84, SD = .89). The individual indicator that ranked the lowest was “keep students with behavior problems on task with difficult assignments” (M = 3.94, SD = 1.10).

Table 4
Teachers’ Assessment of Administrative General Support (n = 81)

<table>
<thead>
<tr>
<th>Construct Items</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supports me in my interaction with parents.</td>
<td>5.10</td>
<td>1.22</td>
</tr>
<tr>
<td>Supports my actions and ideas.</td>
<td>5.05</td>
<td>1.16</td>
</tr>
<tr>
<td>Has my respect and trust.</td>
<td>4.98</td>
<td>1.31</td>
</tr>
<tr>
<td>Understands my program and what I do.</td>
<td>4.73</td>
<td>1.38</td>
</tr>
<tr>
<td>Informs me about school/district policies.</td>
<td>4.68</td>
<td>1.24</td>
</tr>
<tr>
<td>Provides leadership for what I am trying to achieve.</td>
<td>4.64</td>
<td>1.52</td>
</tr>
<tr>
<td>Helps me solve problems.</td>
<td>4.58</td>
<td>1.47</td>
</tr>
<tr>
<td>Supports mainstreaming students with disabilities.</td>
<td>4.56</td>
<td>1.33</td>
</tr>
<tr>
<td>Explains reasons behind programs and practices.</td>
<td>4.51</td>
<td>1.44</td>
</tr>
<tr>
<td>Provides current teaching/learning information.</td>
<td>4.38</td>
<td>1.45</td>
</tr>
<tr>
<td>Attends to my feelings and needs.</td>
<td>4.37</td>
<td>1.45</td>
</tr>
<tr>
<td>Assists in mainstreaming students with disabilities.</td>
<td>4.36</td>
<td>1.45</td>
</tr>
</tbody>
</table>

Administrative Support (Summated Score) 4.66 1.16

Note. Scale: 1 = disagree, 6 = agree

Table 5
Self–Efficacy of Working with Students with Special Needs (n = 81)

<table>
<thead>
<tr>
<th>Construct Items</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manage disruptive behavior in the classroom.</td>
<td>4.84</td>
<td>.89</td>
</tr>
<tr>
<td>Get children to follow classroom rules.</td>
<td>4.79</td>
<td>.88</td>
</tr>
<tr>
<td>Prevent problem behavior on school grounds.</td>
<td>4.63</td>
<td>.93</td>
</tr>
<tr>
<td>Help special education students learn in a regular classroom.</td>
<td>4.53</td>
<td>.94</td>
</tr>
<tr>
<td>Reach students with the most learning problems.</td>
<td>4.31</td>
<td>.87</td>
</tr>
<tr>
<td>Reach students with the most behavior problems.</td>
<td>4.12</td>
<td>1.08</td>
</tr>
<tr>
<td>Overcome the influence of environment on learning and behavior problems.</td>
<td>4.11</td>
<td>1.04</td>
</tr>
<tr>
<td>Individualize learning for students with learning problems.</td>
<td>4.09</td>
<td>1.10</td>
</tr>
<tr>
<td>Keep students with learning problems on task with difficult assignments.</td>
<td>4.06</td>
<td>.89</td>
</tr>
<tr>
<td>Individualize learning for students with behavior problems.</td>
<td>4.02</td>
<td>1.15</td>
</tr>
<tr>
<td>Keep students with behavior problems on task with difficult assignments.</td>
<td>3.94</td>
<td>1.10</td>
</tr>
<tr>
<td>Teachers’ Self–Efficacy (Summated Score)</td>
<td>4.31</td>
<td>.72</td>
</tr>
</tbody>
</table>

Note. Scale: 1 = nothing, 6 = a great deal
Describing the self–perceived success of early career agriculture teachers’ ability to teach students with special needs was the purpose of the fourth research objective. Early career agriculture teachers in this study reported their self–perceived success toward teaching students who possess special needs ($M = 4.72, SD = .90$) (see Table 6). The item ranked the highest was “successfully teaching students with learning problems” with a mean of $4.85 (SD = 1.01)$. Working with special education teachers to include students with disabilities in the classroom ranked the lowest ($M = 4.58, SD = 1.27$).

Table 6
Self–Perceived Success of Early Career Agriculture Teachers When Working with Students with Special Needs ($n = 81$)

<table>
<thead>
<tr>
<th>Construct Items:</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Successfully taught students with learning problems</td>
<td>4.85</td>
<td>1.01</td>
</tr>
<tr>
<td>Successfully included special education students</td>
<td>4.84</td>
<td>1.16</td>
</tr>
<tr>
<td>Successfully worked with special education teachers to include students with disabilities in my classes</td>
<td>4.62</td>
<td>1.24</td>
</tr>
<tr>
<td>Successfully taught behavior problem students</td>
<td>4.58</td>
<td>1.27</td>
</tr>
<tr>
<td>Self–Perceived Success (Summated Score)</td>
<td>4.72</td>
<td>.90</td>
</tr>
</tbody>
</table>

*Note. Scale: 1 = disagree, 6 = agree*

To address research objective five, a hierarchical regression analysis was calculated. The control variables of administrative support, pre–service preparation, and in–service programs were entered simultaneously and accounted for 13% of the variance in self–perceived success of working with students with special needs (see Table 7). When the variable of interest, teacher efficacy, was added, 27% of the variance in self–perceived success of working with students with special needs could be explained. Teacher efficacy accounted for an additional 14% of the variance beyond the contribution of teacher preparation, administrator support, and in–service participation.

Table 7
Summary of Hierarchical Regression Analysis for Variables Predicting Teacher Efficacy

<table>
<thead>
<tr>
<th>Variable</th>
<th>$\Delta R^2$</th>
<th>$\beta$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1</td>
<td>.13</td>
<td></td>
</tr>
<tr>
<td>Administrator Support</td>
<td>–.01</td>
<td></td>
</tr>
<tr>
<td>Teacher Preparation</td>
<td>.30</td>
<td></td>
</tr>
<tr>
<td>In–service Programs</td>
<td>.12</td>
<td></td>
</tr>
<tr>
<td>Step 2</td>
<td>.14</td>
<td></td>
</tr>
<tr>
<td>Administrator Support</td>
<td>–.02</td>
<td></td>
</tr>
<tr>
<td>Teacher Preparation</td>
<td>.13</td>
<td></td>
</tr>
<tr>
<td>In–service Programs</td>
<td>–.02</td>
<td></td>
</tr>
<tr>
<td>Teacher Efficacy</td>
<td>.46*</td>
<td></td>
</tr>
<tr>
<td>Total $R^2$</td>
<td>.27</td>
<td></td>
</tr>
<tr>
<td>$n$</td>
<td>81</td>
<td></td>
</tr>
</tbody>
</table>

*Note. *$^a$Control variables included administrator support, teacher preparation, and in–service programs. *$^p < .05$
Conclusions and Recommendations

Results from this study are limited to the population for which data were collected and should not be generalized beyond this population. Despite teacher preparation programs addressing the topic of teaching students with special needs, differences in teacher efficacy and self-perceived success suggest early career teachers may lack self-perceived preparedness for the classroom. Agriculture teachers in the state of Missouri with five years or less of experience were nearly evenly split between male and female. Ninety-five percent of teachers in this study certified to teach through a university teacher preparation program. This population of teachers predominately held a bachelor’s degree. These teachers also reported lower mean scores for university preparation than their self perceived success or self efficacy. Although universities often require special education requirements, findings suggest university preparation may not be successful in the eyes of early career teachers.

What activities or instruction should be included in university preparation of pre-service teachers? Is it possible that university preparation is adequate, yet lacks felt need until pre-service teachers enter the classroom? Would additional experiences increase teacher efficacy?

Four teacher perception areas were examined, including perceptions of their teacher preparation, in-service participation focused on special needs, administrative support, and self-efficacy. These findings suggest early career agriculture teachers perceive administrators as generally supportive of their efforts to address students with special needs. In addition, the findings for administrative support approached the findings of Brownell and Pajares (1999), yet yielded higher results than Ross’s (2006) findings. These findings also support the recommendations of Knobloch and Whittington (2002), which suggested teacher educators and instructional leaders should promote a sense of belonging to an efficacious team for novice teachers. Perhaps teacher educators should incorporate more coursework designed to prepare future teachers for building positive relationships with administrators. It would appear beneficial for teacher educators to encourage interaction between pre-service teachers and administrators.

Although participants perceived supportive administration, they had a much lower level of agreement on the in-service construct. The findings of the study may suggest limited in-service activities address students with special needs. This finding supports the research by Ross (2006) and Brownell and Pajares (1999). Telljohann et al. (1996) found health education in-service programs increased teachers’ efficacy. Could this also be found in agricultural education? If agriculture teachers were able to access additional in-service activities focusing specifically on working with students with special needs, would their teacher efficacy increase? Does the hands-on nature of agriculture suggest a need for specific in-service training to increase interactive curriculum for students with special needs? Teacher educators should examine the specific components within agriculture education, such as supervised agriculture experience (SAE) program, which may necessitate additional in-service training focused on accommodating students with special needs.

Teachers vary in their perceptions of teacher preparation program’s ability to address teaching students with special needs. Previous research by Ross (2006) and Brownell and Pajares (1999) found less level of agreement of teachers’ perceived pre-service preparation for teaching students with special needs.

Overall, early career teachers reported some success in teaching students with special needs, illustrated by their perceived self-efficacy and self-perceived success. Findings indicated higher self-efficacy than the previous research of Ross (2006) and Brownell and Pajares (1999). It appears teachers have a moderate level of confidence in their ability to teach students with special needs, as indicated by their self-efficacy. Similarly, teachers suggest moderate levels of success instructing this group of students. According to the theoretical framework provided by Brownell and Pajares, teachers holding higher levels of efficacy towards working with students with special needs should demonstrate more success with this student population.

Findings from this study suggest efficacy of early career teachers parallels their reported success teaching students with special needs. Further, this finding supports a study of student teachers in the southeastern United States that found teachers to be adequately confident when
teaching students with special needs (Kessell et al., 2006). Can self–perceived success of teaching students with special needs be correlated to actual competence in the classroom? What specific areas of special needs instruction would benefit the efficacy and self–perceived success of secondary agriculture teachers?

Twenty–seven percent of the variance in self–perceived success of teaching students with special needs could be accounted for by teacher preparation, administrator’s general support, in–service programs, and teacher efficacy. What other factors might account for additional variance in self–perceived success of teaching students with special needs? The variables of teacher preparation, administrator support, and in–service programs accounted for a limited amount (13%) of the variance in early career agriculture teachers’ self–perceived success of working with students with special needs. However, self–efficacy accounted for an additional 14% of the variance in self–perceived success. This finding supports prior research where teacher efficacy had a pronounced effect on teacher’s self–perceived success (Brownell & Pajares, 1999).

Much of the variance in self–perceived success of working with students with special needs is still unknown and should be the goal of future research efforts if we are to effectively teach all agricultural education students. The hands–on, practical experience students in agricultural education programs may be a factor for enrollment in agriculture classes by students with special needs. Agriculture teachers must be equipped to teach these diverse learners. The variance in self–perceived success of early career agriculture teachers when working with students with special needs should be examined in other states. Further research should address the apparent gap in perceived competencies need to teach students with special needs. What specific skills or strategies do secondary teachers lack? Research should be conducted to determine effective methods to increase teacher efficacy for instructors of students with special needs. In addition, the self–perceived success of experienced agriculture teachers when working students with special needs may also be the subject of future research. Early career agriculture teachers may need additional in–service opportunities focused on teaching students with special needs. Finally, self–perceived success of teaching students with special needs should be compared to perceptions of teachers credentialed in the area of special needs students.

References


Aschenbrener, Garton, & Ross   Early Career Agriculture…


MOLLIE S. ASCHENBRENER is an Instructor of Agriculture at California State University, California State University, Chico, 95929-0310, maschenbrener@csuchico.edu

BRYAN L. GARTON is a Professor and Associate Dean of Academic Programs for the College of Agriculture, Food and Natural Resources at the University of Missouri, 2-64 Agriculture Building, Columbia, MO, 65211, GartonB@missouri.edu

AMANDA L. ROSS is an Agriculture Instructor at Salisbury High School, Salisbury R-IV Schools1000 S. Maple Ave., Salisbury, MO 65281, aross@salisbury.k12.mo.us
An Investigation of Missouri Secondary Agriculture Teachers’ Perceptions of Interorganizational Cooperative Behavior

Billy R. McKim, Extension Project Specialist
Texas A & M University
Robert M. Torres, Professor & Department Head
University of Arizona
Amy R. Smith, Assistant Professor
South Dakota State University

Interorganizational teams have the potential to accomplish more than the sum of individual efforts of members working independently, provided that members share similar goals and tasks. Thus, an interorganizational team consisting of organizations that share similar roots and educational and outreach objectives would seem logical. Subjects of this study were randomly selected secondary agriculture teachers (n = 140) in Missouri. Factors that teachers perceived as important to cooperation and the perceived affect the factors had on relationships with 4-H youth development personnel were investigated guided by the modified team performance and training framework (Cannon–Bowers, Tannenbaum, Salas, & Volpe, 1995). Mean weighted discrepancy scores were calculated to determine deficiencies between the perceived and desired levels of cooperative activities, as perceived by secondary agriculture teachers. Results indicated that interorganizational behavior was indeed desirable to secondary agriculture teachers. However, despite their desire to cooperate, the perceived level of cooperation was considerably lower than the desired level of cooperation.

Keywords: interorganizational, cooperation, agriculture teachers, 4-H youth development personnel

Introduction

An effective team is comprised of members who are interdependent in their pursuit of common goals and tasks; hence, teams usually accomplish more than the sum of individual efforts of members working independently (Bass, 2008). Teams composed of organizations benefit in a similar fashion, given that the members in both organizations share similar goals and tasks (Johnson & Johnson, 2009). Effective organizations must serve the interests of their constituents and stakeholders from whom they draw their charter and resources; if organizations do not, they will suffer from a loss of resources and support (Tjosvold, 1990).

Within the arena of agricultural education, there are a number of organizations considered to be members of Team Ag Ed (“Team Ag Ed,” n.d.). Specifically, the following organizations are recognized as Team Ag Ed members: American Association for Agricultural Education (AAAE), Agricultural Education Supervisors, AgrowKnowledge, Association for Career and Technical Education (ACTE), National Association of Agricultural Educators (NAAE), National FFA Alumni, Collegiate FFA, National FFA Foundation, National FFA Organization, National Farm & Ranch Business Management Education Association, Inc. (NFRBMEA Inc.), National Postsecondary Agriculture Student Organization (PAS), National Young Farmer Educational Association (NYFEA), The National Council for Agricultural Education, and U.S. Department of Education (“Team Ag Ed,” n.d.). Certainly, among these organizations, there is a great deal of cooperation and collaboration in effort to
provide agricultural education related opportunities and “promote local program success” (“Team Ag Ed,” n.d.). However, upon review of the Team Ag Ed model, one organization appears to be absent. One might wonder, where does the Cooperative Extension Service and 4–H Youth Development fit? Without a doubt, secondary agricultural education programs and the 4–H programs offered through the Cooperative Extension Service draw their charters from similar roots. The Smith–Lever Act of 1914 and the Smith–Hughes Act of 1917 were each national initiatives that addressed the need for educating rural people in agriculture (Lemons, 1958). Education in the community and the school are closely related (Hamlin, 1949); the school cooperates with the agencies of the community, but remains a separate organization. Similarities also exist between the organizations’ role “in providing knowledge, skills, and competencies that relate to agriculture” (Schroeder & Moss, 1984, p. 4). More recently, National Program Standards developed by Team Ag Ed have recognized the value of school and community partnerships (“Agricultural Education’s Major Initiatives,” 2007) which certainly could extend to include partnerships between secondary agriculture (education in the school) and Cooperative Extension Service initiatives (education in the community).

While the policies and goals of secondary agricultural education programs and the Extension service are similar, the organizations have historically encountered challenges in cooperating with one another. To be effective, organizations must be mindful of their goal and cooperate to accomplish the goal. Without a goal, outcome, or reward, interdependence is unlikely; thereby diminishing any reason to cooperate (Johnson & Johnson, 2009).

Previous attempts to develop memoranda of understanding between secondary agricultural education programs and the Extension service may be viewed as goals of cooperation; however, on state and national levels, these efforts were not successful (Hamlin, 1949). In a report on the nature of memoranda of understanding between Extension services and State Departments of Vocational Education, Rogers (as cited in Lemons, 1958; Omar, 1963) noted the existence of 17 memoranda. Most formal agreements and understandings have outlined what individual states determined to be appropriate responsibilities of agriculture teachers and Extension personnel. Furthermore, many state–developed agreements have determined youth eligibility for membership in 4–H and FFA and restrictions limiting or allowing membership in both educational organizations.

**Theoretical Framework**

One specific theoretical framework pertaining to cooperation by secondary agriculture teachers does not exist; thus, this study was guided by the modified team performance and training framework developed by Cannon–Bowers, Tannenbaum, Salas, and Volpe (1995). “A team is a set of interpersonal interactions structured to achieve established goals” (Johnson & Johnson, 2009, p. 526). Arguably, because of the similar roots and shared educational and outreach initiatives, secondary agriculture teachers and 4–H youth development personnel can be viewed as members of the same team. To describe potential team training requirements needed to facilitate cooperation between secondary agriculture teachers and 4–H youth development personnel, this particular framework was deemed appropriate.

The modified team performance and training framework (Figure 1) was based upon the premise that to establish appropriate training procedures, one must first identify the team’s task and work characteristics, and determine competency requirements (Cannon–Bowers et al., 1995). Johnston, Smith–Jentsch, and Cannon–Bowers (1997) proposed that to improve the effectiveness of an organization, collecting outcome data alone is not adequate; identifying unique situational conditions is also necessary. Moreover, “…the goal should not be to train people to make the right decision in a given scenario, but to learn to make the right decision” (p. 313).
Specifically, the aforementioned framework consists of four primary components, one of which is of particular interest to this study. The team competency requirements component addresses the teamwork skills, team-relevant knowledge, and team attitudes (Cannon–Bowers et al., 1995). Ultimately, if members of a team have the appropriate team competency requirements for the context or setting, increased performance and effectiveness will result (Cannon–Bowers et al., 1995). If not, the final component of the model, team training requirements and strategies, becomes increasingly important as additional training based on the team competencies needed is required for success (Cannon–Bowers et al., 1995).

As a component of a larger study, this study sought to identify secondary agriculture teachers’ team competency toward cooperating with 4-H youth development personnel. Based upon the findings from this study, recommendations for training and professional development for both groups may contribute to more collaborative, effective teamwork between the two.

Related Research

Lemons’ (1958) Tennessee study investigated perceptions of cooperation between vocational agriculture teachers and county agents, noting that a majority of vocational agriculture teachers and county agents perceived their working relationships with one another as good or excellent. In Louisiana, Buddle (1981) conducted a study of cooperative relationships between county Extension agents and teachers of vocational agriculture and suggested that similarity or differences in their programs, and initiative in contacting one another were among the most influential factors. In Schroeder and Moss' (1984) study of agriculture teachers and Extension agents in North Carolina, no single factor was reported to hinder cooperation. However, differences existed between perceived appropriateness and actual occurrence of cooperative activities. Diatta and Luft (1986) reported nearly opposite findings among secondary vocational agriculture teachers and county agents in South Dakota.

Several studies were conducted regarding cooperation between secondary agriculture educators and Extension agents in Florida (Grage, Ricketts, & Place, 2002; Grage, Place, & Ricketts, 2004; Ricketts & Place, 2005). In a qualitative study, Grage et al. (2002) noted that effective collaborative relationships were occurring, which allowed secondary agriculture educators and Extension faculty to accomplish essential outcomes. When secondary agriculture educators and Extension faculty relied on one another’s strengths, their effectiveness and efficiency increased (Grage et al., 2002). Ricketts and Place noted mutual respect toward one another and communication efforts as having a positive influence on cooperative relationships.

Possible barriers to cooperative relationships, including time constraints,
programmatic differences, and inequitable resources were identified by Bruce and Ricketts (2007) in their study in Pennsylvania. Grage et al. (2002) suggested that imperfect relationships, insufficient awareness of each other’s profession, and participant biases regarding cooperation also hindered cooperation. Competition was identified as having positive and negative aspects when present in a cooperative relationship (Grage et al., 2002). Similar findings were iterated by Grage et al., as well as Ricketts and Place who additionally noted the importance of the two organizations sharing resources and having open communication.

Bruce and Ricketts (2008) explored the concept of “co–opetition” as a potential solution to the lack of cooperation among secondary agriculture teachers and 4–H youth development personnel. Through co–opetition, a term coined by the business and management sector, two traditionally competitive organizations can simultaneously cooperate and compete with one another (Bruce & Ricketts, 2008). How could an attitude of co–opetition be fostered between the two groups of interest?

**Purpose and Research Objectives**

Each of the previously noted studies reported specific activities or factors that contributed to or hindered cooperative relationships. Though the number of studies conducted on cooperative relationships between secondary agriculture teachers and 4–H youth development personnel have been numerous, disagreement exists regarding what influences the level and extent of cooperative behavior. The mere existence of cooperative agreements and memoranda would indicate that individual states and the federal government have acknowledged that cooperation between secondary agriculture teachers and 4–H youth development personnel is important and must be clarified. Thus, this study sought to explore the cooperative nature between secondary agriculture teachers and 4–H youth development personnel, as perceived by secondary agriculture teachers. The following research objectives guided the study:

1. Describe factors that secondary agriculture teachers perceive as important toward cooperative relationships with 4–H youth development personnel and their perceived influence on cooperative relationships.
2. Describe and prioritize perceived and desired levels of participation on cooperative activities.
3. Describe and prioritize perceived levels of importance regarding activities/factors that influence cooperative behaviors.

**Procedures**

The population for this non–experimental quantitative study was secondary agriculture teachers in Missouri during the spring of 2008. The 2007–2008 Missouri Agricultural Education Directory, included a total of 414 secondary agriculture teachers. In accordance with the recommendations of Krejcie and Morgan (1970), a sample size of 210 teachers was identified.

The data collection instruments developed by Omar (1963), Smith (1966), and Schroeder and Moss (1984) were consulted during the development of the five–sectioned questionnaire used in this study. Three sections were used to address the research objectives of this study. The first section consisted of a double–matrix containing 12 statements representing a sampling of youth development activities. The second section consisted of a double–matrix containing seven statements representing a sampling of factors related to professional relationships between secondary agriculture teachers and 4–H youth development personnel. Subjects were asked to respond to each statement twice; regarding the perceived current frequency and desired frequency of the activity. The second section consisted of a double–matrix containing seven statements representing a sampling of factors related to professional relationships between secondary agriculture teachers and 4–H youth development personnel. Subjects were asked to respond to each statement twice; first regarding the perceived importance of factors to each subject, and secondly, regarding the perceived effect that the factor had on the subjects’ relationship with secondary agriculture teachers. Section three also used a double–matrix which consisted of 13 statements which sought to determine the perceived influence that each activity or factor had on the level of cooperation. Using a five–point Likert–type scale, each subject was asked to indicate the perceived level of what is and what should be with regard to how each activity or factor influences their professional relationship with 4–H youth development personnel.
A mixed–mode design, as referenced by Dillman (2007), was implemented. Subjects were first provided with a mail questionnaire, followed by an electronic questionnaire in the sequence order suggested by Converse, Wolfe, Huang, and Oswald (2008). Content and face validity of the data collection instrument were determined by a panel of eight experts; whom were either faculty members from the University of Missouri Department of Agricultural Education, secondary agriculture teachers, or representatives of the University of Missouri Extension Service. Unimode construction principles (Dillman, 2007) were followed when creating the electronic version of the questionnaire to reduce the possibility of inconsistencies in responses due to the mixed–mode data collection approach.

A pilot test was conducted to determine the reliability estimates of the sections within the questionnaire when administered to individuals with similar characteristics of secondary agriculture teachers in the sample. In this case, 100 secondary agriculture teachers, not selected to comprise the sample, were included in the pilot group Cronbach’s alpha coefficients (see Table 1) were calculated for each of the subscales (importance, influence, perceived, desired, what is, what should be), resulting in coefficients ranging from .83 to .93 (n = 42).

<table>
<thead>
<tr>
<th>Subsection</th>
<th>“What Is”</th>
<th>“What Should Be”</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 &amp; 2</td>
<td>.93</td>
<td>.90</td>
</tr>
<tr>
<td>3</td>
<td>.91</td>
<td>.83</td>
</tr>
</tbody>
</table>

A mixed–mode data collection design was implemented for this study, guided by Dillman (2007). Subjects were provided with a mail questionnaire, followed by an electronic questionnaire in the sequence suggested by Converse, Wolfe, Huang, and Oswald (2008). Providing subjects with the option of choosing which mode of responding was suggested to have little effect on responses (Converse, et al., 2008). A response rate of 65% (n = 136) was obtained.

Procedures for handling non–response error were followed as outlined in Miller and Smith (1983). Respondent and non–respondent data were compared using an independent samples t–test to compare the variables of interest—what is and what should be for each subsection. No significant differences (p > .05) were found between respondent and non–respondent data; therefore, the non–respondent data were pooled with respondent data, yielding a final response rate of 69% (n = 143).

To determine where discrepancies existed for objectives two and three, two ratings had to be taken into account simultaneously; hence, the Borich (1980) needs assessment model was utilized to determine the discrepancy for each cooperative activity. A discrepancy score was determined by taking the desired level of participation in cooperative activities (what should be) minus the perceived level of participation in cooperative activities (what is) for each respondent on each activity. A weighted discrepancy score was then calculated by multiplying each discrepancy score by the associated mean desired level of participation in cooperative activities rating of the activity. Lastly, a mean weighted discrepancy score (MWDS) was calculated by taking the sum of the weighted discrepancy scores for each activity and dividing it by the number of respondents in each group. To prioritize the activities in need of attention, items were ranked from high to low based on the MWDS.

**Findings**

Research objective one sought to describe factors that secondary agriculture teachers perceived as being important toward cooperative relationships and the perceived influence on cooperative relationships. Secondary agriculture teachers were asked how important each factor was and what influence they perceived each factor to have on his/her professional relationship. Mode was used as a more conservative descriptor of central tendency to order the factors as perceived by secondary
agriculture teachers which are summarized in Table 2.

<table>
<thead>
<tr>
<th>Factor</th>
<th>Importance</th>
<th>Influence</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>Mutual respect of efforts</td>
<td>4.33</td>
<td>0.84</td>
</tr>
<tr>
<td>Personality of the Extension faculty or staff member</td>
<td>4.03</td>
<td>1.01</td>
</tr>
<tr>
<td>Success of the Extension faculty or staff member</td>
<td>3.52</td>
<td>1.08</td>
</tr>
<tr>
<td>Frequency of interaction</td>
<td>3.31</td>
<td>0.91</td>
</tr>
<tr>
<td>Views passed down from county or state administrators</td>
<td>3.08</td>
<td>1.01</td>
</tr>
<tr>
<td>Similarity of age</td>
<td>2.11</td>
<td>1.09</td>
</tr>
<tr>
<td>Belief that 4-H and FFA are always in competition with one another</td>
<td>1.89</td>
<td>1.01</td>
</tr>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>4.10</td>
<td>1.01</td>
</tr>
<tr>
<td></td>
<td>3.72</td>
<td>1.14</td>
</tr>
<tr>
<td></td>
<td>3.64</td>
<td>0.91</td>
</tr>
<tr>
<td></td>
<td>3.57</td>
<td>0.92</td>
</tr>
<tr>
<td></td>
<td>3.23</td>
<td>0.80</td>
</tr>
<tr>
<td></td>
<td>3.14</td>
<td>0.64</td>
</tr>
<tr>
<td></td>
<td>2.51</td>
<td>1.04</td>
</tr>
</tbody>
</table>

*Note. Importance Scale: 1 = Not at All Important; 3 = Some; 5 = Very Much Important. Influence Scale: 1 = Very Negative; 2 = Slightly Negative; 3 = Neutral; 4 = Slightly Positive; 5 = Very Positive*

Research objective two sought to describe and prioritize perceived and desired levels of participation on cooperative activities. Differences between perceived and desired levels of secondary agriculture teachers’ participation in 12 cooperative activities are summarized in Table 3 and ordered by priority level based on the MWDS for each item. Mode was included for each item as a secondary and more conservative indicator of central tendency.
Research objective three sought to describe and prioritize perceived levels of importance regarding activities/factors that influence cooperative behaviors. Activity/factor items were analyzed to determine the differences of what is and what should be and were ranked from high to low (see Table 4) based on the MWDS for each item. The mean score for what should be was higher than what is for 12 of the 13 activity/factor items. Additionally, secondary agriculture teachers perceived what is for all activity/factor items as less than very important. One negative discrepancy is reported, similarity or difference in our age (MWDS = –0.02), which would indicate that the level of what is was low and the level of what should be was lower.

Table 3
Secondary Agriculture Teacher’s Difference of Perceived and Desired Level of Participation in Activities (n = 140)

<table>
<thead>
<tr>
<th>Rank</th>
<th>Activity</th>
<th>MWDS</th>
<th>What Is</th>
<th>What Should Be</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Discuss advancements in instructional materials available for teaching educational programs in agriculture</td>
<td>5.18</td>
<td>2.01</td>
<td>1.10</td>
</tr>
<tr>
<td>2</td>
<td>Serve as consultants to each other's advisory committee</td>
<td>5.13</td>
<td>1.96</td>
<td>1.19</td>
</tr>
<tr>
<td>3</td>
<td>Coordinate efforts for training similar competitive teams</td>
<td>5.01</td>
<td>2.07</td>
<td>1.20</td>
</tr>
<tr>
<td>4</td>
<td>Share responsibility for publicity concerning educational programs in agriculture in the county</td>
<td>4.66</td>
<td>2.35</td>
<td>1.24</td>
</tr>
<tr>
<td>5</td>
<td>Conduct joint demonstrations, workshops, or county field days</td>
<td>4.30</td>
<td>2.18</td>
<td>1.09</td>
</tr>
<tr>
<td>6</td>
<td>Identify common educational objectives of Extension and high school agriculture programs</td>
<td>4.29</td>
<td>2.16</td>
<td>1.06</td>
</tr>
<tr>
<td>7</td>
<td>Coordinate efforts toward similar goals related to youth</td>
<td>4.27</td>
<td>2.74</td>
<td>1.25</td>
</tr>
<tr>
<td>8</td>
<td>Consult each other's special abilities and knowledge in problem situations</td>
<td>4.14</td>
<td>2.60</td>
<td>1.25</td>
</tr>
<tr>
<td>9</td>
<td>Discuss community needs pertaining to agriculture</td>
<td>4.12</td>
<td>2.44</td>
<td>1.10</td>
</tr>
<tr>
<td>10</td>
<td>Discuss space and facilities available for conducting education programs in agriculture</td>
<td>3.95</td>
<td>2.11</td>
<td>1.12</td>
</tr>
<tr>
<td>11</td>
<td>Exchange or forward e-mail messages which might be beneficial to the other's program</td>
<td>3.83</td>
<td>2.62</td>
<td>1.27</td>
</tr>
<tr>
<td>12</td>
<td>Discuss fundraising activities</td>
<td>2.51</td>
<td>1.53</td>
<td>0.85</td>
</tr>
</tbody>
</table>

Note: Perceived and Desired Scale: 1 = Never; 2 = Rarely; 3 = Occasionally; 4 = Frequently; 5 = Always
Table 4
Secondary Agriculture Teacher’s Difference of Perceived “What Is” and “What Should Be” Regarding the Importance of Activities/Factors (n = 140)

<table>
<thead>
<tr>
<th>Rank</th>
<th>Activity</th>
<th>MWDS</th>
<th>What Is</th>
<th>What Should Be</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Coordination of efforts for training similar competitive teams (i.e. livestock judging)</td>
<td>4.38</td>
<td>2.56</td>
<td>1.20</td>
</tr>
<tr>
<td>2</td>
<td>Consulting each other's knowledge or special abilities in problem situations</td>
<td>4.31</td>
<td>2.94</td>
<td>1.21</td>
</tr>
<tr>
<td>3</td>
<td>Plan events so that they are not in competition with one another</td>
<td>3.63</td>
<td>3.01</td>
<td>1.31</td>
</tr>
<tr>
<td>4</td>
<td>Having the Extension agent be a guest presenter in a class or at an FFA meeting</td>
<td>3.53</td>
<td>2.74</td>
<td>1.15</td>
</tr>
<tr>
<td>5</td>
<td>Initiative in contacting one another</td>
<td>3.46</td>
<td>2.94</td>
<td>1.20</td>
</tr>
<tr>
<td>6</td>
<td>Willingness to serve a portion or all of the county</td>
<td>3.02</td>
<td>3.24</td>
<td>1.19</td>
</tr>
<tr>
<td>7</td>
<td>Similarity in program goals</td>
<td>2.98</td>
<td>2.88</td>
<td>1.07</td>
</tr>
<tr>
<td>8</td>
<td>Compatibility of personality</td>
<td>1.72</td>
<td>3.17</td>
<td>1.09</td>
</tr>
<tr>
<td>9</td>
<td>Degree of personal friendship</td>
<td>0.98</td>
<td>2.83</td>
<td>1.15</td>
</tr>
<tr>
<td>10</td>
<td>Differences of program structure (4–H &amp; FFA)</td>
<td>0.73</td>
<td>2.59</td>
<td>1.04</td>
</tr>
<tr>
<td>11</td>
<td>Tenure at present location</td>
<td>0.21</td>
<td>2.36</td>
<td>1.12</td>
</tr>
<tr>
<td>12</td>
<td>Variation in total years experience</td>
<td>0.15</td>
<td>2.34</td>
<td>0.99</td>
</tr>
<tr>
<td>13</td>
<td>Similarity or difference in our age</td>
<td>−0.02</td>
<td>2.18</td>
<td>1.12</td>
</tr>
</tbody>
</table>

Note: What Is and What Should Be Scale: 1 = Not at All Important; 3 = Some; 5 = Very Much Important

Conclusions/Implications/Recommendations

Secondary agriculture teachers’ cooperative relationships are most influenced by a mutual respect of efforts and the personality of the Extension faculty or staff member with whom they are interacting. These findings support those of Grage et al. (2002) who suggested agriculture educators and Extension faculty desired cooperative interdisciplinary relationships, emphasizing mutual respect and communication. Successful cooperation in agricultural activities depends largely on the attitude and reaction of the personnel involved (Ball, 1938). Although secondary agriculture teachers are not able to change the personality of 4–H youth development personnel, they can attempt to establish mutual respect with and for their counterparts. Deutsch (2003) noted that “…helping people to develop a respect for themselves and their interests enables them to see their conflicts in a reasonable proportion and facilitates their constructive confrontation” (p. 27). The question remains, which organization will have to give respect first in order for the other group to reciprocate, in an effort to eventually establish mutual respect? Further study may be justified to determine how to best establish a mutually respectful relationship between secondary agriculture teachers and 4–H youth development personnel. By analyzing collaborative, effective relationships between members of these two organizations, insight may be gained as to how such relationships can be developed.

Secondary agriculture teachers perceived frequency of interaction as having little or no influence and only some importance on their cooperative relationships. For cooperation to be successful, ongoing and frequent interaction of the parties expecting to cooperate must occur (Axelrod, 1984, 1997). A key element of a successful cooperative relationship could be found in the phrase “you scratch my back, I'll scratch yours.” How can “back scratching” occur if only one group is present to scratch?
Opportunities for interaction should be created and promoted to interested parties in effort to encourage involvement and cooperation.

The second research objective sought to describe and prioritize perceived and desired levels of participation on cooperative activities. The three highest priority items, discussing instructional materials, serving on each other's advisory committee, and coordinating efforts for training similar competitive teams, could potentially be resolved through increased communication. Deficiencies may be linked to the secondary agriculture teachers' perception that frequency of interaction had little or no influence and only some importance to cooperative relationships. These findings varied from those of Schroeder and Moss (1984) which would indicate that further research should be conducted to determine if there is any correlation between the highest deficiencies and the perceived importance of communication and interaction.

The third research objective sought to describe and prioritize perceived levels of importance regarding activities/factors that influence cooperative behaviors. Secondary agriculture teachers perceived activity/factor items as having neutral to no importance; however, they indicated that 12 of 13 activity/factor items should be more important than what they are, with the exception of discuss fundraising activities. The indication that little importance is placed on cooperative activities/factors may lead one to question if secondary agriculture teachers and 4–H youth development personnel are making an honest effort to cooperate.

Items noting coordinating efforts for training similar competitive teams and conducting joint demonstrations, workshops, or county field days, were the areas requiring the greatest amount of attention. Both are related to youth development activities; more specifically activities related to 4–H and FFA. These observations further support Grage et al. (2004), Ricketts and Place (2005), and Bruce and Ricketts (2007) who noted the importance of sharing resources and open communication. The concept of co–opetition (Bruce & Ricketts, 2008) also seems particularly relevant to these items. Though typically, many 4–H and FFA youth development activities are viewed from a competitive standpoint, if a more cooperative competitive mentality was embraced, available resources would be more efficiently utilized and even greater number of youth could benefit. Administrators of both organizations must also support joint endeavors so that secondary agriculture teachers and 4–H youth development personnel are truly able to function as a team.

Secondary agriculture teachers, in many cases, recognized differences between what is and what should be. The highest MWDS were related to integrating resources of 4–H youth development personnel with those of secondary agriculture educators. Inequitable resources were noted by Bruce and Ricketts (2007) as possible barriers to cooperation. Although a desire to increase the importance of interaction between 4–H youth development personnel and secondary agriculture teachers is evident, barriers exist that are preventing secondary agriculture teachers from increasing their interaction. As Bruce and Ricketts suggested, such barriers must be overcome in the interest of efficiency which will eventually yield a reward such as a reduced work load or time saved for all of those who are involved.

A suggestion offered by Cannon–Bowers et al. (1995) was to develop shared situational awareness, or a common understanding of the situation. This could be accomplished by a joint advisory committee, as suggested by Stimson (1920). Stimson suggested that conferences or committees were necessary to coordinate efforts of the federally funded agencies providing agriculture education in order to avoid overlapping and overlooking. “Good teamwork could hardly be expected in the absence of such conferences” (p. 359). Conferences and similar joint activities could certainly increase the awareness of secondary agriculture teachers and 4–H youth development personnel regarding one another’s programs, though arguably, an understanding and appreciation of each organization should also be fostered consistently by the institutions that prepare individuals for careers in these areas. If additional efforts were made to educate those pursuing careers in secondary agriculture and 4–H youth development about opportunities for collaboration, it seems logical that program graduates would then be more likely to seek such interaction.

One item yielded a negative MWDS, which may seem counterintuitive. However, if one
were to consider the item similarity or difference in our age (MWSD = –0.02), the negative score would indicate that secondary agriculture teachers realized that the age of their counterpart should be less important than what it was. Arguably, the influence of factors that possess a negative connotation could be reduced with the appropriate undergraduate and in–service training. Training, based on the team competencies needed is required for success (Cannon–Bowers et al., 1995); therefore, comparing the needs of secondary agriculture teachers and 4–H youth development personnel would allow individuals charged with designing undergraduate and in–service training the needed insight to identify possible cooperative activities. However, as previously noted, the goal should not be to “…train people to make the right decision in a given scenario, but to learn to make the right decision” (Johnston et al. 1997, p. 313). Therefore, undergraduate and in–service training should incorporate the results from periodic needs assessments.

The highest discrepancy items were related to coordination and consultation, both of which require communication. In order for cooperation between secondary agriculture teachers and 4–H youth development personnel to be successful, the members of both organizations will have to be persistent in their efforts toward open communication and frequent interaction. Items with the highest discrepancy scores were also closely related to the youth development aspects of the secondary agriculture teachers’ profession rather than the semantics of program structures and the compatibility of attitudes. As leaders in agricultural education, Team Ag Ed has a unique opportunity to lead by example in identifying compatible areas between secondary agricultural education and 4–H youth development programs; thereby, developing school and community partnerships (“Agricultural Education’s Major Initiatives,” 2007) to “provide knowledge, skills, and competencies that relate to agriculture” (Schroeder & Moss, 1984, p. 4). To accomplish this task, Team Ag Ed should consider expanding their team to include non–formal education counterparts; thus creating a more holistic agricultural education team.

Integrating resources available in the community, such as farms, greenhouses, and agriculture-related businesses, to supplement the curriculum and use as potential laboratories (Bender et al., 1972) would seem intuitive to professions operating under budgetary restraints. Because administrators must frequently be mindful of budgetary items, they should consider the efficiency that interorganizational cooperation offers their organization, such as saved time and reduced workload (Bruce & Ricketts, 2007). The premise that cooperation is efficient is further substantiated by Johnson and Johnson (2009) who noted that the most productive group is the one that cooperates. It may be appropriate for state administrators to distribute mutually beneficial information through the channels of the list-serves, which may further inform secondary agriculture teachers of potential opportunities to cooperate with 4–H youth development personnel.

Many of the aforementioned recommendations will require organizational leaders and administrators to invest time and effort in facilitating change to promote cooperation between the organizations. To do so, state administrators must be mindful that change will require both organizations to frequently evaluate joint goals to determine where adjustments are needed. Moreover, both secondary agriculture teachers and 4–H youth development personnel must possess the appropriate team competency requirements for the context or setting to increase performance and effectiveness (Cannon–Bowers et al., 1995). Arguably, this may only occur if all team members concentrate on the performance of the interorganizational team toward accomplishing a shared set of goals (Bass, 2008).

References


Smith, W. L. (1966). An examination of the cooperative cognition between vocational agriculture instructors and county extension Agents in planning and conducting the adult prospectus of instruction in Oklahoma. (Unpublished master’s thesis). Oklahoma State University, Stillwater, OK.


BILLY R. MCKIM is an Extension Project Specialist in the Department of Agricultural Leadership, Education, and Communications at Texas A&M University, 2116 TAMU, College Station, TX 77843-2116, BMcKim@aged.tamu.edu.
ROBERT M. TORRES is a Professor & Department Head in the Department of Agricultural Education at the University of Arizona, 205 Old FCS Building, Tucson Arizona, AZ, 85721, rtorres@CALS.arizona.edu

AMY R. SMITH is an Assistant Professor of Agricultural Education in the Department of Teaching, Learning, and Leadership at South Dakota State University, Box 507, 102 Wenona, Brookings, SD 57007, Amy.R.Smith@sdstate.edu.
Program Needs of Middle School Agricultural Education Teachers: A Delphi Study

John Rayfield, Assistant Professor
Texas A&M University

Barry Croom, Associate Professor,
North Carolina State University

This study examined program needs of middle school agricultural education teachers in North Carolina. A three-round Delphi technique used two open-ended questions to collect information from an expert panel of middle school agricultural education teachers. Each panel member was asked to respond to: Question one: “What can be done on the local, state and national levels to improve middle school agricultural education programs?” Question two: “When looking at the three circle model for agricultural education, what improvements can be made for middle school agricultural education related to FFA, Supervised Agricultural Experience (SAE), and classroom instruction?” Panel members identified 29 areas of concern on the local, state, and national level and 19 areas related to FFA, SAE, and classroom instruction. Middle school agricultural education teachers in [State] believe that the curriculum for their students should contain more hands-on activities and should have a stronger agricultural focus. This panel of teachers also revealed that there are many more concerns with FFA activities for middle school students than there are for SAE and classroom instruction.

Keywords: middle school agricultural education, middle school agricultural education teachers, middle school agricultural education programs

Introduction/Theoretical Framework

The middle school agricultural education program is the starting point for many students to explore industries and occupations associated with food, fiber and natural resources (National Council for Agricultural Education, 2002). Middle grades agricultural education programs are important to the total agricultural education profession because they are often the initial point of contact for students who have an interest in the agricultural industry.

There are approximately 1652 middle school agriculture teachers in the United States (Kantrovich, 2007). Of these, 427 teaching exclusively at the middle school level. These instructors teach a mixture of agricultural technology and career exploration topics to approximately 70,000 middle school students enrolled in agricultural education. Approximately 30,000 of these students are members of the National FFA Organization (National FFA Organization, 2002).
The theoretical framework for this study was based on Erikson’s Social–Emotional Development Theory and constructivist theory. Erik Erikson identified human socialization as an eight–stage process with each stage arriving as the result of an internal need that must be met in order to reach the intended result. The first stage in Erikson’s Model is from birth to the second year of life, and is characterized by the individual learning to trust others. In stage two, ages two to four, the individual begins to develop a need for autonomy, and a child’s need to be assertive. Erikson identified the third stage as the “play” stage where children learn to imagine and play cooperatively with other children (Erickson & Coles, 2000).

Erikson’s fourth stage begins sometime around the age where the child goes to school. In stage four, the child begins to master peer relations, cognitive skills in reading and math, and the complex rules associated with formal play and organized recreation. Children are likely to enter middle school during this stage. Erikson’s fifth stage is just beginning as the child departs from middle school. It is characterized by a need to develop a unique identity. After the middle school years, individuals proceed toward young adulthood where they hone their sense of identity in preparation for developing love relationships with others. In middle adulthood, they build upon their intimate relationships by becoming care–givers through parenting and mentoring. In Erikson’s final stage of human growth and development, adults come to terms with their existence by reflecting on their lives in a positive manner (Erickson & Coles, 2000).

Erikson offered theories about the cognitive, social, and emotional development of adolescents. These theories explain what subject matter is developmentally appropriate for adolescents. However the question still remains, “How do adolescents learn?” John Locke (1632–1704) explained learning in this manner; all humans are born with a mind like a blank sheet of paper, a tabula rasa. As humans experience things (nature, weather, etc.) the mind begins to write knowledge upon this blank page. Locke proposed that all of our knowledge and understanding arises out of prior experiences (Magee, 2001). Similarly, constructivists propose that all knowledge arises out of previous knowledge, regardless of how an individual is taught (Bransford, Brown, & Cocking, 1999). Learning is enhanced when teachers recognize the knowledge and beliefs that students bring to class, and when they use this prior knowledge to teach new concepts (White & Frederickson, 1997, 1998). Early vocational education efforts emphasized realistic training identical to vocational experiences outside of school (Talbert, Vaughn, & Croom, 2005). Thorndike (1913) proposed that the success of the learning experience was dependent upon how closely the in–school experiences and out–of–school work experiences are matched.

To create valuable learning experiences, middle grades teachers must have a positive disposition toward adolescents as evidenced by their enthusiasm in teaching, their respect for adolescents, and their realistic and challenging expectations of students (National Middle School Association, 2002). Instructional strategies used by teachers to make content meaningful to students include accessing prior knowledge in students by examining the similarities and differences between subject matter and the students’ own personal experiences, summarizing information periodically during a lesson, providing positive reinforcement, setting individual learning goals, and providing a structure for feedback (Hunter 1967, 1971; Marzano, 2003).

Teachers should focus instructional efforts on three major areas: career exploration, agricultural literacy and guided personal development. Because of the vast number of agricultural occupations available to high school and college graduates today, it is essential that students receive a concentrated and directed study of agricultural careers at some point before graduating from middle school. An effective middle school curriculum offers students the opportunity to learn about agricultural careers, and some of the skills needed in those careers (Talbert, Vaughn, & Croom, 2005, National FFA Organization, 1996, Frick, 1993).

FFA leadership programs should equip students with the capability to envision their preferred future and take action to bring their vision to fruition. FFA members learn the importance of continuous personal improvement and awareness of social and environmental issues through leadership development activities. The development of positive relationships with others is another essential ingredient that allows
the FFA leader to get things accomplished. Without a network of supportive individuals, leaders often find leading a very difficult task (Croom, 2003).

Rossetti and McCaslin (1994) found that students had a greater understanding of agriculture and were more likely to be informed about careers in agriculture than students who were not enrolled in a middle grades agricultural education program. If the student chooses to continue to take agriscience courses in high school, the supervised agricultural experiences he or she began in middle school can blend into a high school supervised agricultural experience program (Talbert et al., 2005). Middle grades students enter into supervised agricultural experiences that are exploratory, experimental, or analytical and can develop an individual program that combines two or more supervised agricultural experience elements.

Providing agricultural education programs for middle school students is a noble idea, but how effective are middle school programs? How do middle school agricultural education teachers view the local, state, and national status of their programs? Has the agricultural education profession placed sufficient emphasis in and resources on the growth of development of middle grades education?

**Purpose and Objectives**

The purpose of this study was to identify areas of concern among middle school agricultural education teachers regarding the status of middle school agricultural education. The objective of the study was to identify areas on the local, state, and national level within FFA, SAE and classroom instruction that need improvement.

**Methods**

A three–round Delphi technique was used to conduct this study. The Delphi technique is a group process designed to solicit expert responses toward reaching consensus on a particular problem, topic, or issue (Delp, Thesen, Motiwalla, & Seshadri, 1977). According to Linstone and Turoff (1975) “the Delphi technique may be characterized as a method for structuring a group so that the process is effective in allowing a group of individuals as a whole, to deal with complex problems” (p. 13). The Delphi method allows a group to reach consensus on a certain concept without bringing the subjects in personal contact with each other (Akers, 2000).

The panel of experts consisted of middle school agricultural education teachers in North Carolina. These teachers were selected as experts because they were currently teaching middle school agricultural education in North Carolina. Thirty–five teachers were invited to participate in the initial round of the survey. Seventeen teachers agreed to participate in the study and replied to the first round of the survey. According to Dalkey (1969), when the group size for a Delphi study is larger than 13, the reliability is higher than .80.

In the first round of the survey an instrument was mailed to the panel of experts. This instrument consisted of two open–ended questions designed to generate a variety of responses. Question one: “What can be done on the local, state, and national levels to improve middle school agricultural education programs?” Question two: “When looking at the three circle model for agricultural education, what improvements can be made for middle school agricultural education related to FFA, SAE, and classroom instruction?” The questions were validated by a panel experts made up of four university faculty and two state agricultural education leaders for content and face validity. A list of all responses was compiled and three independent readers collapsed the responses into similar categories. Responses from the first question were categorized as: curriculum, facility, professional, youth development, or school system issues. Responses from the second question were categorized as FFA, SAE, or classroom instruction.

In the second round, the panel of experts was sent a web–based survey and asked to rate the responses from round one on a four–point Likert–type scale (1 = strongly disagree, 2 = disagree, 3 = agree, and 4 = strongly agree). The researchers determined *a priori* that only those factors reaching 80% consensus from the panel would be used as factors when developing instrumentation for future rounds. Consensus of an item was determined by 80% or higher level of agreement on the four–point Likert–type scale. The panel was notified after each subsequent round of the level of agreement on
Factors reaching 80% consensus or higher. Factors that failed to reach 80% consensus were resubmitted to panel members for further consideration. The researchers used Dillman’s Tailored Design Method (Dillman, 2000) to solicit responses. All 17 panel members from round one replied to the round two survey. Frequencies, percentages, and ranks were used to evaluate the second round responses.

In round three, the items that reached 80% consensus in the previous round were set aside. Only the items that failed to reach 80% consensus were included in round three. Eight items generated from question one of the initial survey were included in round three. Three of these were curriculum issues, three were school system issues, one was related to facilities, and one to youth development. Six items generated from question two of the initial survey were included in the third round. Four of those were FFA related issues, one was related to SAE and the final was a classroom instruction issue. Frequencies, percentages, and ranks were used to evaluate the third round responses. Fourteen panel members from the previous rounds responded to the final round of the survey yielding a 78% response rate for the final round. Due to the remaining factors failure to reach consensus of 80% or higher in round three, the researchers determined a sufficient degree of consensus had been attained. No further iterations were necessary.

Findings

The first open-ended question: “What can be done on the local, state, and national levels to improve middle school agricultural education programs?” produced 12 areas of concern related to curriculum with nine items reaching 80% consensus in round two. All seven issues middle school teachers face on a professional level reached an 80% or higher level of agreement among panel members. Six areas related to their respective school systems were identified in round one with three reaching consensus in round two and three being carried over to round three but failing to reach consensus. Two issues regarding facilities were noted with one reaching consensus from the panel members and the other moving to the third round of the survey. Finally, two issues related to youth development arose with one reaching consensus in round two and the other being moved to the final round. A total of 21 items related to improvement of middle school agricultural education reached 80% or higher consensus among panel members.

In the area of curriculum, North Carolina middle school agricultural education teachers believe the curriculum should be more hands-on and activity based. This group of teachers also believed that political squabbling over curriculum development should end. On a professional level, middle school agricultural education teachers in North Carolina believe that their school administrators should be educated on the importance of middle school agricultural education programs and these teachers should be offered some type of extended year contract. These teachers also felt that students should be held accountable for performance in agricultural education classes at the middle school level. These teachers identified the need for better equipment and materials for their programs and a need for more career development events for their students who join FFA. Table 1 displays round one categorized responses that reached 80% or higher level of agreement among panel members in round two of the survey.
Table 1

Responses Related to Improvement of Middle School Agricultural Education Programs

<table>
<thead>
<tr>
<th>Categorized Response</th>
<th>Round Two Percent Agreement</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Curriculum</strong></td>
<td></td>
</tr>
<tr>
<td>Curriculum should be more hands–on and activity based</td>
<td>95.7</td>
</tr>
<tr>
<td>Remove political squabbling over curriculum development</td>
<td>94.0</td>
</tr>
<tr>
<td>Specific curriculum for 6th, 7th, and 8th grade</td>
<td>86.7</td>
</tr>
<tr>
<td>Wider variety of courses to meet needs of rural and urban students</td>
<td>85.2</td>
</tr>
<tr>
<td>Make the middle school biotech course an elective (retain interested students)</td>
<td>85.2</td>
</tr>
<tr>
<td>Improve middle school curriculum</td>
<td>84.7</td>
</tr>
<tr>
<td>Curriculum needs stronger focus on agriculture</td>
<td>84.7</td>
</tr>
<tr>
<td>Develop exploring curriculum based on (ag commodities, animals, plants)</td>
<td>83.7</td>
</tr>
<tr>
<td>Develop introductory course for 6th graders</td>
<td>82.0</td>
</tr>
<tr>
<td><strong>Professional</strong></td>
<td></td>
</tr>
<tr>
<td>Educate school administrators on the importance of middle school programs</td>
<td>94.5</td>
</tr>
<tr>
<td>11 month contracts so teachers can participate in summer activities</td>
<td>87.5</td>
</tr>
<tr>
<td>More networking among current middle school teachers</td>
<td>86.7</td>
</tr>
<tr>
<td>More in–service for middle school ag ed teachers</td>
<td>86.0</td>
</tr>
<tr>
<td>Complete listing of all middle school teachers and programs (e–mail addresses)</td>
<td>86.0</td>
</tr>
<tr>
<td>Treat middle school teachers the same as high school teachers (neglected, not included)</td>
<td>83.2</td>
</tr>
<tr>
<td>Improve recognition for middle school programs (FFA Foundation for high school)</td>
<td>81.7</td>
</tr>
<tr>
<td><strong>School System</strong></td>
<td></td>
</tr>
<tr>
<td>Students should be held accountable for performance in these classes</td>
<td>90.2</td>
</tr>
<tr>
<td>Middle schools should feed into a high school program</td>
<td>84.5</td>
</tr>
<tr>
<td>More interaction between middle and high school programs</td>
<td>83.2</td>
</tr>
<tr>
<td><strong>Facility</strong></td>
<td></td>
</tr>
<tr>
<td>Better materials and equipment for middle school programs</td>
<td>89.0</td>
</tr>
<tr>
<td><strong>Youth Development</strong></td>
<td></td>
</tr>
<tr>
<td>More career development events for middle school FFA members</td>
<td>80.5</td>
</tr>
</tbody>
</table>

*Note. Percentages are derived from the frequency of participant responses on a 4–point scale (1 = strongly disagree, 4 = strongly agree).*

Eight items from the first open–ended question, “What can be done on the local, state, and national levels to improve middle school agricultural education programs?” failed to reach 80% consensus among panel members. These items were resubmitted to panel members for further consideration in round three. Offering a week of FFA camp specifically designed for middle school students was the only item that moved to consensus from round two to round three. Table 2 shows categorized responses with round two and round three percentage of agreement.
Table 2

<table>
<thead>
<tr>
<th>Responses Related to Improvement of Middle School Agricultural Education Programs Not Reaching 80% Consensus</th>
<th>Categorized Response</th>
<th>Round Two Percent Agreement</th>
<th>Round Three Percent Agreement</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Curriculum</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>More opportunities for exploration (not mini–high school programs)</td>
<td></td>
<td>79.2</td>
<td>79.7</td>
</tr>
<tr>
<td>Expand curriculum with more agriculture emphasis and less biotechnology emphasis</td>
<td></td>
<td>72.7</td>
<td>71.0</td>
</tr>
<tr>
<td>More consistency state wide on course design (9 weeks)</td>
<td></td>
<td>73.5</td>
<td>73.5</td>
</tr>
<tr>
<td><strong>School System</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lower class size</td>
<td></td>
<td>73.5</td>
<td>75.0</td>
</tr>
<tr>
<td>Increase class time (38–42 minutes is not enough)</td>
<td></td>
<td>70.7</td>
<td>73.5</td>
</tr>
<tr>
<td>Students not interested in agriculture are forced to take class</td>
<td></td>
<td>68.0</td>
<td>68.7</td>
</tr>
<tr>
<td><strong>Facility</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Design classrooms for agriculture education, not science</td>
<td></td>
<td>79.0</td>
<td>78.2</td>
</tr>
<tr>
<td><strong>Youth Development</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Offer a week of middle school FFA camp</td>
<td></td>
<td>79.7</td>
<td>*82.0</td>
</tr>
</tbody>
</table>

*Note. Percentages are derived from the frequency of participant responses on a 4–point scale (1 = strongly disagree, 4 = strongly agree). Asterisk * indicates the item that reached consensus in round three.

The second open–ended question: “When looking at the three circle model for agricultural education, what improvements can be made for middle school agricultural education related to FFA, SAE, and classroom instruction?” produced nine areas of improvement for middle school FFA activities with five reaching consensus in round two. Six areas of improvement for middle school SAE were identified with five reaching 80% or higher level of agreement in round two. Four areas of improvement for classroom instruction surfaced with three of those reaching consensus in round two of the survey. Table 3 contains categorized responses that reached 80% or higher level of agreement among panel members in round two of the survey.
Table 3

<table>
<thead>
<tr>
<th>Responses Related to the Three Components of the Agricultural Education Program</th>
<th>Categorized Response</th>
<th>Round Two Percent Agreement</th>
<th>Round Three Percent Agreement</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>FFA</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>More recognition on regional state level for middle school FFA accomplishments</td>
<td>83.7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Make career development events more middle school friendly</td>
<td>81.7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Club time during school day for FFA</td>
<td>81.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>True middle school CDEs not junior events where middle school competes against 9th graders</td>
<td>80.7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Financial support for FFA programs in low income areas (dues)</td>
<td>80.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>SAE</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Develop SAE shadow experience</td>
<td>86.7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scaled down version of SAE for middle school students</td>
<td>86.7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Share ideas for creative SAEs</td>
<td>85.7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SAE is tough to establish in 9 week grading period</td>
<td>85.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Make SAE more user friendly for middle school students</td>
<td>82.7</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Classroom Instruction</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Funding for large purchases (materials &amp; equipment) less available for middle school</td>
<td>86.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Middle school and high school instruction should provide students the same opportunities (greenhouse)</td>
<td>84.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Instruction and curriculum should be more exploratory in nature</td>
<td>81.7</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note. Percentages are derived from the frequency of participant responses on a 4–point scale (1 = strongly disagree, 4 = strongly agree).*

Six items from the second open–ended question, “When looking at the three circle model for agricultural education, what improvements can be made for middle school agricultural education related to FFA, SAE, and classroom instruction?” failed to reach consensus in round two of the survey. These items were resubmitted to panel members in round three for further consideration. None of the remaining items moved to 80% consensus among panel members. Table 4 shows categorized responses with round two and round three percentage of agreement.

Table 4

<table>
<thead>
<tr>
<th>Responses Related to the Three Components of the Agricultural Education Program Not Reaching 80% Consensus</th>
<th>Categorized Response</th>
<th>Round Two Percent Agreement</th>
<th>Round Three Percent Agreement</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>FFA</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Offer middle school proficiency awards</td>
<td>79.0</td>
<td>79.7</td>
<td></td>
</tr>
<tr>
<td>On–line course for middle school teachers on FFA programs</td>
<td>79.0</td>
<td>79.7</td>
<td></td>
</tr>
<tr>
<td>National FFA should recognize 6th graders as active members</td>
<td>76.2</td>
<td>78.2</td>
<td></td>
</tr>
<tr>
<td>FFA events for urban middle school students</td>
<td>76.2</td>
<td>76.5</td>
<td></td>
</tr>
<tr>
<td><strong>SAE</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Create more SAE opportunities for middle school students</td>
<td>76.5</td>
<td>78.2</td>
<td></td>
</tr>
<tr>
<td><strong>Classroom Instruction</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Instruction for biotechnology curriculum is hard (too advanced for middle school)</td>
<td>66.5</td>
<td>67.2</td>
<td></td>
</tr>
</tbody>
</table>

*Note. Percentages are derived from the frequency of participant responses on a 4–point scale (1 = strongly disagree, 4 = strongly agree).*
Conclusions

Results from this study are limited in terms of generalizability with all of the respondents being from one state. Another limitation to the study is that some issues/concerns posed by this group of teachers are localized in nature. According to this panel of middle school agricultural education teachers, there is significant room for improvement in the middle grades agricultural education curriculum. These teachers would like for the curriculum to access the advanced psychomotor skills and higher order thinking skills of students while focusing on authentic agriculture content, particularly in the area of marketing, animal science, and plant science. The panelists also prefer to reach an agreement between the state department of public instruction and the state leadership for agricultural education with regard to the future direction for middle grades agricultural education.

The panel members believe that school administrators should be more informed about the importance of their agricultural education programs. This is likely a marketing and perception problem faced by most agricultural education programs in the state, and not totally confined to middle school agricultural education. Middle school agricultural education teachers in North Carolina also believe they should be rewarded with extended year contracts for FFA activities and SAE supervision. They believe there should be more in–service for their specific group which would give them more opportunities to network with their colleagues. In other words, middle school teachers want the same respect and opportunities as their high school colleagues.

With regard to FFA and SAE programming, panelists would like to see more depth to the FFA program and less depth in the SAE program. FFA programs need to be more flexible and designed for the middle school audience. This may mean having more FFA activities during the normal school day, and establishing more introductory level FFA career development events. SAE, on the other hand, should be scaled back to a level that allows middle graders to explore lots of different career options. The current year–long approach to SAE program development may not be a viable alternative at the middle grades level because teachers may only be able to supervise students for one nine week period during the year. With regard to the profession of teaching, panelists would like for their students to be more accountable for their performance in class with greater academic emphasis being placed on agricultural education classes. A high percentage of these teachers wish that their facilities and equipment were more up to date.

Discussion and Recommendations

Middle school agricultural education programs are the headwaters for high school agricultural education programs. Students who discover the new world of agricultural science in the middle school classroom may choose to continue their journey into this new world by enrolling in the high school agricultural education program. The middle school program can be an important place for students to begin to make decisions about their life and career goals. Yet this study raises important questions about the present status of middle grades agricultural education. Specifically, how does curriculum measure up against what we know about the growth and development of adolescents? How can the program be structured so that curriculum and instruction, FFA and SAE components are developmentally appropriate for students in the middle grades? These are the questions in the minds of middle school agricultural education teachers.

The panelists generated twice as many concerns related to FFA activities as they did for classroom instruction, indicating that middle school FFA programming is a prime area for improvement. Panelists indicated that FFA offers many opportunities for student recognition which may have the indirect benefit of providing recognition for the accomplishments of teachers. Teachers and students tend to view FFA as the “fun” part of agricultural education, and this may be the motivation for many students to enroll in agriculture classes. With leadership development, competition, team participation and travel opportunities, FFA may be the best hope for getting students ”turned on” to agricultural science careers. Perhaps FFA can do
this even better than SAE can for middle school students.

Panelists indicated that SAE was much more challenging to involve middle school students in than FFA activities. Perhaps this is not so much an indictment of the agricultural education profession’s failure to promote and encourage SAE as it is an indication of what teacher’s value. A number of studies point towards the need for a middle school curriculum that helps students begin developing career aspirations. Yet agricultural educators may still view SAE programs as entrepreneurial and production–oriented, and use this view to explain why their students do not have SAE’s in middle school. If we can believe Erikson’s theory of social development, middle school students are not developmentally capable of making business management decisions. In middle school agricultural education, job placement opportunities are hindered by the age and maturity level of middle graders. The structure of most middle school agricultural education programs is such that students only receive nine weeks or a semester of instruction and this makes it difficult to establish a long–term supervised agricultural experience program. The teachers in this study noted the difficulties associated with establishing an SAE project in that short length of time. While some state FFA associations have implemented proficiency awards for middle school students, there is no national emphasis on middle school proficiency awards. So, it would be easy for the middle school teacher to argue against a strong SAE program in their school. That is, if teachers are willing to ignore the recent trends in supervised agricultural experience like the development of scientifically–based research projects, service learning, and volunteer activities designed to improve communities. Even the concept of exploratory SAE, an old idea relatively speaking, it can be useful at the middle grades level. SAEs may not be able to close the gap between middle school and secondary agricultural education programs, but it certainly has the potential to smooth the rough pavement between the two by introducing students to concepts that they will explore more in depth at the high school level.

This study also surfaced a few concerns about program administration. Inadequate resources, lack of facilities, high student–teacher ratios, and various economics factors were all cited as barriers to the total agricultural education program. Perhaps these concerns arise out of the natural evolution of agricultural education programs. Teachers are exploring new and innovative ways to improve instruction, SAE, and FFA activities, and these concerns arise out of an understanding of the present condition of the program as it relates to some preferred condition in the future. If the profession embraces the concept of problem–solving instruction, then it must work to develop strategies that middle school agricultural education teachers can use to improve instruction, FFA, and SAE at the middle school level.

Based on the findings of this study, the researchers concluded that there are many issues facing middle school agricultural education teachers that warrant future study. Before the agricultural education profession proposes a growth plan that advocates the creation of many new middle school agricultural education programs, we should listen to the concerns of our existing middle school educators and work to fill in the gaps that are currently exist on the local, state, and national level related to FFA, SAE, and classroom instruction.

Further Research

Given the results of this study, there are many recommendations for further research. Replication of this study on a national level would be helpful in identifying areas of concern that have broader implications. A study of this nature would clarify many of the FFA and SAE concerns identified by the teachers in this study and would help eliminate those issues that were specific to this particular state. The use of more extensive qualitative methods in this area of research may yield valuable data. Conducting focus groups for middle school agricultural education teachers at national and regional NAAE conferences could provide a richer and more thorough description of the challenges faced by middle school agricultural educators.

Curriculum concerns were a consistent theme in this study. With the development of many new curricular choices in agricultural education, have we addressed any of these concerns? Do the new curriculum models address the needs of middle school students at a
developmentally appropriate level? Future research is needed to examine the effectiveness and appropriateness of the latest curriculum developed for the middle grades audience in agricultural education.

The three circle model for agricultural education has long been the signature for our discipline. Another avenue for further research is exploring a new model for middle school agricultural education. Many teachers reported that there programs looked like “mini high school programs.” Will a different model for middle school agricultural education eliminate this stereotype and help to expand this program into a more viable choice for exploratory class offerings in urban and suburban areas looking to expand their curriculum?

References


JOHN RAYFIELD is a Assistant Professor of in the Department of Agricultural Leadership, Education and Communications at Texas A&M University, 104-A Scoates Hall, MS 2116 Texas A&M University, college Station, TX 77843-2116, jrayfield@tamu.edu

BARRY CROOM is an Associate Professor in the Department of Agricultural and Extension Education at North Carolina State University, Box 7607, Raleigh, North Carolina 27695-7607, barry_croom@ncsu.edu
How Oklahoma State University Students Spent their Time Student Teaching in Agricultural Education: A Fall versus Spring Semester Comparison with Implications for Teacher Education

J. Shane Robinson, Assistant Professor
Sheyenne Krysher, Graduate Student
J. Chris Haynes, Graduate Student
M. Craig Edwards, Professor
Oklahoma State University

This causal comparative study assessed differences in the way fall and spring semester student teachers spent their time performing various duties: observing, teaching specific curricula, laboratory instruction, activities outside of school, and supervision of Supervised Agricultural Experiences (SAEs). It was found that fall semester student teachers spent more time observing than spring semester student teachers. Additionally, fall semester student teachers spent more time in school overall than spring semester student teachers; spring semester student teachers spent significantly more time out of school during school hours. In terms of curriculum, both fall and spring semester student teachers devoted the most instructional time to teaching Agriscience I and II. Both groups spent approximately the same amount of time instructing in a classroom or laboratory setting. It also was found that spring semester student teachers devoted more time to supervising students’ SAEs than did their fall semester counterparts.

Keywords: causal comparative, student teachers, time allocation

Introduction and Theoretical Framework

Time is a precious resource. Once it is gone, it never returns. As such, it is imperative to utilize time appropriately. Those who manage their time well are more productive on the job (Cohen & Cohen, 1984) because they prioritize important tasks and responsibilities associated with their jobs (Coplin, 2003; Covey, 1989). What is more, as graduation requirements hover between 124–128 credit hours in most undergraduate agricultural education degree plans, finding time to expose pre-service students in teacher preparation programs to real life challenges becomes problematic (Burris, Robinson, & Terry Jr., 2005). Fortunately, the student teaching experience can serve as a way to meet the needs of pre-service interns by exposing them to real life situations, including their allocation and use of work-related time (Torres & Ulmer, 2007).

Student teaching has been referred to as the “capstone experience” of teacher preparation and vital to teacher education efforts (Edgar, Roberts, & Murphy, 2009; Edwards & Briers, 2001; Harlin, Edwards, & Briers, 2002; Nekolny & Butlles, 2007). Opportunities for valuable experiences during student teaching cannot be underestimated when considering its impact on improving teacher effectiveness (Roberts & Ball, 2009; Swanson, 1971). As a result, it allows for practicing effective teaching in a safe environment under the guidance of a mentor teacher, which may ultimately influence whether an individual decides to enter the teaching profession (Talbert, Vaughn, & Croom, 2005).

Individuals cite many reasons for entering teaching, such as a desire to serve mankind by imparting knowledge to future generations, performing a valuable service to society, and for the love of children (Ornstein & Levine, 1989). Talbert et al. (2005) posited that agricultural
education teachers are no different from instructors of other disciplines in their reasons for entering the profession. However, preparation for career development events (CDEs), advising an FFA chapter, supervising students’ Supervised Agricultural Experiences (SAEs), and maintaining overall quality of a program may be additional roles and responsibilities aspirants consider when choosing a career as an agriculture teacher (Torres, Ulmer, & Aschenbrener, 2008).

With these opportunities come added expectations. It is assumed secondary agricultural educators are technically competent in classroom and laboratory instruction (Edwards & Thompson, 2010), managing FFA activities, and supervising SAEs (National FFA Organization, 2009). However, for competence to be acquired, student teachers need exposure to these roles during their student teaching experience. Historically, agricultural education has been experiential in nature (Roberts, 2006). Because the curriculum is diverse, multiple opportunities exist for student teachers to teach across the curriculum in areas such as agricultural mechanics, animal and plant sciences, horticulture and greenhouse production, as well as basic exploratory and introductory courses. Experiencing the opportunity to teach across the curriculum can be essential to student teachers’ growth because, from John Dewey’s perspective, experiential learning is seen “as central to successful educational activity” (Gordon, 2008, p. 29).

Researchers in agricultural education have long signified the need to provide teachers additional opportunities to acquire technical competence (Edwards & Thompson, 2010). Moreover, it could be implied that when student teachers are allowed to teach across the curriculum, their technical skills are enhanced. Recommendations have included pre–service and in–service education for learning how to integrate technical content into the secondary agricultural education curriculum (Edwards & Thompson, 2010; Harris & Birkenholz, 1996; Myers & Dyer, 2004; Parr, Edwards, & Leising, 2009; Warnick, Thompson, & Gummer, 2004; Young, Edwards, & Leising, 2009). Further, recommendations have sought to focus pre–service students on the importance of integrating content through cross–curricular instruction (Conroy & Walker, 2000) and developing new models within pre–service teacher education programs to advocate for and solicit integration practices (Kotrlik, Redmann, & Douglas, 2003; Parr et al., 2009; Young et al., 2009).

Those recommendations were made in an attempt to better equip early–career teachers with technical knowledge and skills. Although these opportunities are important and should continue to be promoted to hone the skills of pre–service and practicing teachers, the student teaching experience should also serve as an ideal setting in which novices acquire more technical expertise (Burris et al., 2005) by teaching a variety of curriculum under the guidance of a cooperating teacher.

However, Torres et al. (2008) opined that little research has been conducted on teacher workload and the allocation of hours spent during the student teaching internship. Understanding where student teachers spend their time during these experiences is important. Coplin (2003) surmised that, generally, people should be able to “handle multiple assignments over a two– or three–week period, as well as to not miss highly routine activities, such as submitting weekly reports” (p. 15). As such, a means for understanding where student teachers spent their time was through the assessment of their weekly journal reflections or reports.

It has been suggested that increased demands on secondary agricultural education teachers’ time may be the reason for a lack of teacher effort in all phases of the program, such as SAEs (Warren & Flowers, 1993). With teacher work weeks in secondary agricultural education programs ranging, on average, between 45 to 65 hours (Cole, 1981), time management practices must be followed (Warren & Flowers, 1993). Warren and Flowers stated, “With the push for more comprehensive agriculture programs, increased student–to–teacher ratios and a high demand on accountability, instructor work–loads have become more time consuming” (p. 69). So, it is important to know where and how teachers choose to spend their time, including beginners.

Conceptually, this study was based on describing the time student teachers allocated to various aspects of their internship experience. It has been suggested that the amount of time teachers allocate to various activities can improve student learning and achievement overall (Carroll, 1989; Gettinger, 1985;
In agricultural education, recent efforts by various researchers (e.g., Nekolny & Buttles, 2007; Torres & Ulmer, 2007; Torres et al., 2008) have described where student teachers invest their time while interning. Torres and Ulmer (2007) analyzed five years of University of Missouri student teacher data \( (N = 55) \) from 1999 to 2003 and categorized this into five three–week intervals. When totaled, their study revealed that 2.73 hours per week were spent in observation, 8.44 hours per week were spent in planning, 8.19 hours per week were spent teaching, 10.80 hours per week were spent conducting teacher–related activities, and 2.05 hours per week were invested in administrative activities.

A similar study by Nekolny and Buttles (2007) sought to determine the differences in time allotted for various teaching activities of fall and spring student teachers at the University of Wisconsin–River Falls from 2003 to 2006 during an 18–week internship. The authors divided and analyzed their data in six three–week intervals. When summed, the study revealed that fall student teachers averaged 2.58 hours per week in observation as compared to 3.30 hours per week for spring student teachers. Further, fall student teachers spent 3.70 hours per week teaching in contrast to 4.19 hours per week reported by the spring student teachers.

Torres et al. (2008) compared Missouri student teachers \( (N = 13) \), first year teachers \( (N = 11) \), and experienced teachers \( (N = 11) \), in 2006, on how they distributed their time in the classroom. The authors found that the three groups did not “distribute their time equally” (p. 85). The data accumulated during the 15–week student teaching experience was recorded in five three–week intervals. When summed, it was revealed that student teachers invested 1.48 hours per week in observation. Further, student teachers spent 4.80 hours per week teaching compared to 7.37 hours per week for first–year teachers, and 7.04 hours for experienced teachers.

Torres and Ulmer (2007) stated that, “Dialog should occur to explore whether the distributions of time are within [the] level of expectations” (p. 10). However, before teacher educators at Oklahoma State University could address that directive appropriately, it was important to determine how student teachers were spending time as it related to their student teaching internships.

**Purpose and Objectives**

The purpose of this study was to determine how student teachers from the fall 2005 academic semester to the spring 2008 academic semester spent time during their 12–week student teaching experience, and to determine if statistically significant differences existed between those who student taught in the fall semesters and those who student taught in the spring semesters. Specifically, this study sought to describe student teachers’ experiences related to time spent observing versus teaching, teaching across the curriculum, and teaching in the classroom as well as laboratory settings. Further, the study sought to determine how much time student teachers spent in school and out of school and supervising students’ SAEs. The institution studied offers student teaching in both the fall and spring semester. So, of particular interest, was to determine if significant differences existed in the experiences gained in various areas of the student teaching experience by semester (Nekolny & Buttles, 2007). The following objectives guided the study:

1. Compare the amount of time fall and spring student teachers devoted to instruction versus observation.
2. Describe the amount of time fall and spring student teachers devoted to providing instruction in the various curriculum areas of agricultural education.
3. Compare the amount of time fall and spring student teachers spent instructing in the classroom versus the laboratory setting.
4. Compare the amount of time fall and spring student teachers spent in school versus out of school performing programmatic activities.
5. Compare the amount of time fall and spring student teachers devoted to supervising students’ SAEs including entrepreneurial, placement, and exploratory experiences.

Because a portion of this study sought to determine differences between fall and spring semester student teachers regarding their experiences, a series of independent \( t \)–tests were
calculated for objectives 1, 3, 4, and 5. Hypotheses for those objectives are listed below. For objective one, the null hypothesis stated that, in the population studied, no statistically significant ($p < .05$) difference existed between fall and spring semester student teachers for the hours spent teaching and observing ($H_0$: $\mu_1$ fall = $\mu_2$ spring). To address objective three, the null hypothesis stated that, in the population studied, no statistically significant ($p < .05$) difference existed between fall and spring semester student teachers in the hours spent teaching in the classroom versus the laboratory ($H_0$: $\mu_1$ fall = $\mu_2$ spring).

For objective four, the null hypothesis stated that, in the population studied, no statistically significant ($p < .05$) difference existed between fall and spring semester student teachers in regard to hours spent in school and out of school ($H_0$: $\mu_1$ fall = $\mu_2$ spring). Lastly, to address objective five, the null hypothesis stated that, in the population studied, no statistically significant ($p < .05$) difference existed between these two groups in the amount of time devoted to supervising the three types of students’ SAEs specified ($H_0$: $\mu_1$ fall = $\mu_2$ spring).

Methods and Procedures

This causal comparative study relied on data collected from student teachers during their 12–week student teaching experiences. The total population consisted of three years of student teachers who participated in either a fall or spring semester student teaching experience from fall 2005 to spring 2008 ($N = 70$). In all, three fall semesters ($n = 22$) and three spring semesters ($n = 48$) of student teachers’ weekly reports were compiled and summated for ease of readability, comparison, and interpretation. It was assumed that these six semesters of student teachers were no different from other students in previous years. So, this study was a “time and place” sample (Oliver & Hinkle, 1982) and allowed for the use of inferential statistics (i.e., $t$–tests).

Data were retrieved from archived, weekly journal reflection reports submitted electronically by student teachers during each week of their 12–week student teaching experience. Students self-reported the number of clock hours spent performing various teacher roles: observation, teaching (classroom and laboratory settings), including instruction of specific curricula, time in alternate settings (i.e., co–curricular events during school hours), and SAE supervision. Each report was reviewed and data were recorded into a Microsoft Excel spreadsheet for analysis. To analyze the data, descriptive statistics, such as means, standard deviations, frequencies, and percentages were employed. Additionally, $t$–tests were performed to determine whether statistically significant differences existed between the time allocations of fall and spring student teachers. The Cohen’s $d$ statistic was used to assess the practical significance of selected findings (Cohen, 1988). An alpha level of .05 was employed a priori.

Notably, no distinctions were made among the variations of class length. Per the weekly, journal reflection reports, only class “periods” were denoted. As such, one hour was recorded for each period taught whether the class session was 45 minutes in length or a 90 minute “block” period. So, slight variations in data exist regarding duration of class periods. Due to these variations, in some instances, standard deviation scores exceed the mean values. Additionally, any period in which a student teacher was not in school during regular school hours was categorized as “out of school.” Examples of time spent “out of school” included student teacher “job” related duties such as attending livestock exhibitions, facilitating CDEs, and observing other teachers (i.e., not their cooperating teachers), as well as personal reasons such as illnesses and interviewing for jobs.

Findings

Objective one sought to determine the amount of student teachers’ time devoted to observation versus instruction. It was revealed that fall student teachers observed eight hours per week ($M = 8.24$, $SD = 7.13$) and taught almost 10 hours per week ($M = 9.89$, $SD = 7.35$) (Table 1). Additionally, spring student teachers observed nearly two hours less ($M = 6.38$, $SD = 7.41$) than fall student teachers. In comparison, spring student teachers taught about one hour less per week than fall student teachers ($M = 8.97$, $SD = 6.77$). A statistically significant difference ($p < .05$) was found for hours spent observing; so, the null hypothesis was rejected.
Table 1
Differences between Student Teachers’ Time Spent Observing versus Teaching by Semester

<table>
<thead>
<tr>
<th>Experience</th>
<th>Fall</th>
<th>Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td>Observed</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>22</td>
<td>48</td>
</tr>
<tr>
<td></td>
<td>8.24</td>
<td>6.38</td>
</tr>
<tr>
<td></td>
<td>7.13</td>
<td>7.41</td>
</tr>
<tr>
<td></td>
<td>0–7</td>
<td>0–7</td>
</tr>
<tr>
<td></td>
<td>3.45</td>
<td>1.71</td>
</tr>
<tr>
<td></td>
<td>.00</td>
<td>.09</td>
</tr>
<tr>
<td>Taught</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>22</td>
<td>48</td>
</tr>
<tr>
<td></td>
<td>9.89</td>
<td>8.97</td>
</tr>
<tr>
<td></td>
<td>7.35</td>
<td>6.77</td>
</tr>
</tbody>
</table>

Note. *Range of units of time (i.e., class periods) spent observing and teaching each week day. *p < .05; bCohen’s d = .26 (“small”); cCohen’s d = .13 (“negligible”)

When assessing time spent teaching, the p-value was .09. Thus, the null hypothesis was not rejected, indicating no statistically significant difference existed between student teachers’ time spent teaching whether they student taught in the fall or spring semester.

Objective two sought to determine the amount of student teachers’ time devoted to instruction by curriculum area. Descriptive statistics were used to address this objective (Table 2). The curricula areas in which fall student teachers invested the most time teaching were Agriscience I and II (M = 4.25, SD = 3.44), Agricultural Power and Technology (M = 1.59, SD = 2.20), Animal/Equine Science (M = 1.29, SD = 1.90), and Plant Sciences/Horticulture/Natural Resources (M = 1.15, SD = 2.25). In contrast, the curricula areas in which spring student teachers invested the most time teaching were Agriscience I and II (M = 3.26, SD = 3.32), Agricultural Power and Technology (M = 1.49, SD = 2.31), 7th and 8th grade Agriculture (M = 1.25, SD = 2.07), and Plant Sciences/Horticulture/Natural Resources (M = 1.08, SD = 2.00).

Both fall and spring semester student teachers spent the least amount of time teaching Food Science (M<sub>fall</sub> = 0.00, SD = 0.00; M<sub>spring</sub> = 0.03, SD = 0.28), CDEs (M<sub>fall</sub> = 0.00, SD = 0.00; M<sub>spring</sub> = 0.19, SD = 0.79), Agribusiness and Marketing (M<sub>fall</sub> = 0.24, SD = 0.98; M<sub>spring</sub> = 0.29, SD = 1.44), and Agricultural Communications (M<sub>fall</sub> = 0.32, SD = 1.09; M<sub>spring</sub> = 0.41, SD = 1.15).

Table 2
Student Teachers’ Time Spent Teaching across the Curriculum

<table>
<thead>
<tr>
<th>Curriculum Area</th>
<th>Fall 2005 to 2007 (N = 22)</th>
<th>Spring 2006 to 2008 (N = 48)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>Agribusiness and Marketing</td>
<td>0.24</td>
<td>.98</td>
</tr>
<tr>
<td>Agricultural Communications</td>
<td>0.32</td>
<td>1.09</td>
</tr>
<tr>
<td>Agricultural Power and Technology</td>
<td>1.59</td>
<td>2.20</td>
</tr>
<tr>
<td>Agriscience I and II</td>
<td>4.25</td>
<td>3.44</td>
</tr>
<tr>
<td>Animal/Equine Science</td>
<td>1.29</td>
<td>1.90</td>
</tr>
<tr>
<td>Career Development Events</td>
<td>0.00</td>
<td>.00</td>
</tr>
<tr>
<td>Food Science</td>
<td>0.00</td>
<td>.00</td>
</tr>
<tr>
<td>Plant Science/Horticulture/Natural Resources</td>
<td>1.15</td>
<td>2.25</td>
</tr>
<tr>
<td>7th and 8th Grade Agriculture</td>
<td>1.08</td>
<td>1.74</td>
</tr>
</tbody>
</table>
Objective three sought to determine the amount of student teachers’ time spent in classroom versus laboratory settings. Fall student teachers taught almost eight hours in the classroom \( (M = 7.90, \text{SD} = 5.75) \) and two hours in the laboratory \( (M = 2.03, \text{SD} = 2.86) \) per week (Table 3).

Table 3  
**Student Teacher’s Time Spent Teaching in the Classroom versus in the Laboratory**

<table>
<thead>
<tr>
<th>Teaching Location</th>
<th>( f )</th>
<th>( M )</th>
<th>( SD )</th>
<th>( t )-value</th>
<th>( p )-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Classroom</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fall</td>
<td>22</td>
<td>7.90</td>
<td>5.75</td>
<td>1.85( ^a )</td>
<td>.06</td>
</tr>
<tr>
<td>Spring</td>
<td>48</td>
<td>7.12</td>
<td>5.36</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Laboratory</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fall</td>
<td>22</td>
<td>2.03</td>
<td>2.86</td>
<td>0.84( ^b )</td>
<td>.40</td>
</tr>
<tr>
<td>Spring</td>
<td>48</td>
<td>1.85</td>
<td>2.83</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note. \(^a\)Cohen’s \( d = .14 \) (“negligible”); \(^b\)Cohen’s \( d = .06 \) (“negligible”)*

In comparison, spring student teachers averaged slightly more than seven hours of teaching in the classroom \( (M = 7.12, \text{SD} = 5.36) \) throughout the semester and nearly two hours per week teaching in the laboratory \( (M = 1.85, \text{SD} = 2.83) \). No statistically significant differences were found between fall and spring student teachers regarding time spent teaching in the classroom and time spent teaching in the laboratory. Accordingly, the null hypothesis was not rejected.

Objective four sought to determine the amount of time spent in school versus out of school devoted to programmatic activities. The fall semester interns spent two additional hours per week in school than did spring student teachers \( (M_{\text{fall}} = 18.69, \text{SD} = 7.51) \) \( (M_{\text{spring}} = 16.61, \text{SD} = 9.10) \) (Table 4), a difference that was statistically significant \( (p < .05) \). So, the null hypothesis \( (H_0: \mu_{\text{fall}} = \mu_{\text{spring}}) \) was rejected. Regarding time spent on programmatic activities out of school, spring student teachers reported approximately one and one-half hours more per week out of school as compared to their fall semester counterparts \( (M_{\text{fall}} = 5.42, \text{SD} = 6.69) \) \( (M_{\text{spring}} = 7.07, \text{SD} = 8.19) \). Again, this difference was statistically significant and the null hypothesis was rejected.

Table 4  
**Student Teacher Time Spent in School versus Out of School**

<table>
<thead>
<tr>
<th>Variable</th>
<th>( f )</th>
<th>( M )</th>
<th>( SD )</th>
<th>( t )-value</th>
<th>( p )-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>In School</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fall</td>
<td>22</td>
<td>18.69</td>
<td>7.51</td>
<td>3.46( ^a )</td>
<td>.00*</td>
</tr>
<tr>
<td>Spring</td>
<td>48</td>
<td>16.61</td>
<td>9.10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Out of School</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fall</td>
<td>22</td>
<td>5.42</td>
<td>6.69</td>
<td>-3.07( ^b )</td>
<td>.00*</td>
</tr>
<tr>
<td>Spring</td>
<td>48</td>
<td>7.07</td>
<td>8.19</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note. \(^a\)p < .05; \(^a\)Cohen’s \( d = .26 \) (“small”); \(^b\)Cohen’s \( d = .13 \) (“negligible”)*

Objective five sought to compare the amount of time student teachers devoted to supervising students’ SAEs. Specifically, each “visit,” or contact, was considered as one hour of time expenditure by the student teacher. It was revealed that fall student teachers spent slightly more than one hour per week supervising students’ SAEs \( (M = 1.13, \text{SD} = \)
2.06), and spring student teachers spent slightly more than one and one-half hours per week similarly \((M = 1.55, \ SD = 3.63)\) (Table 5). An independent sample \(t\)-test yielded a \(p\)-value of 0.03; thus, the null hypothesis \(H_0: \mu_{\text{fall}} = \mu_{\text{spring}}\) was rejected. Further, fall student teachers supervised 279 entrepreneurship, 17 placement, and six exploratory SAEs, and spring student teachers supervised 696 entrepreneurship SAEs, 18 placement SAEs, and one exploratory SAE (Table 6).

### Table 5

<table>
<thead>
<tr>
<th>Variable</th>
<th>(f)</th>
<th>(M)</th>
<th>(SD)</th>
<th>(t)-value</th>
<th>(p)-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supervisory Hours</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fall</td>
<td>22</td>
<td>1.13</td>
<td>2.06</td>
<td>-2.08(^a)</td>
<td>0.03*</td>
</tr>
<tr>
<td>Spring</td>
<td>48</td>
<td>1.55</td>
<td>3.63</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note.* \(^*p < .05; ^{a}Cohen’s \(d = -.14\) (“negligible”)*

### Table 6

<table>
<thead>
<tr>
<th>Types of SAE</th>
<th>Total SAEs Supervised</th>
</tr>
</thead>
<tbody>
<tr>
<td>Entrepreneurship</td>
<td></td>
</tr>
<tr>
<td>Fall</td>
<td>279</td>
</tr>
<tr>
<td>Spring</td>
<td>696</td>
</tr>
<tr>
<td>Placement</td>
<td></td>
</tr>
<tr>
<td>Fall</td>
<td>17</td>
</tr>
<tr>
<td>Spring</td>
<td>18</td>
</tr>
<tr>
<td>Exploratory</td>
<td></td>
</tr>
<tr>
<td>Fall</td>
<td>6</td>
</tr>
<tr>
<td>Spring</td>
<td>1</td>
</tr>
</tbody>
</table>

### Conclusions

This study sought to determine how student teachers spent time during their 12–week student teaching experiences, and determine if statistically significant differences existed between those who student taught in the fall semesters and those who student taught in the spring semesters. Twice as many student teachers taught in the spring semester than in the fall. So, readers are cautioned when making generalizations concerning practical and statistically significant differences between fall and spring semester student teaching experiences.

In all, fall semester student teachers spent more than eight hours per week observing their mentor teachers and nearly 10 hours per week teaching class; however, spring student teachers spent a little more than six hours per week observing and almost nine hours per week teaching. These findings are in excess of previous research (e.g., Nekolny & Buttles, 2007; Torres & Ulmer, 2007; Torres et al., 2008). Of the three aforementioned studies, the findings of this study most closely resemble Missouri student teacher time allocation as described by Torres and Ulmer (2007). However, student teachers at this institution observed two to three more hours per week and taught one to two more hours per week than what Torres and Ulmer reported.

No significant difference was found between the fall and spring semester student teachers’
experiences when assessing hours spent teaching in the classroom versus laboratory setting. Both groups spent more time teaching in a classroom than in a laboratory. Additionally, the groups reported spending seven or more hours teaching in a classroom and about two hours or less instructing in a laboratory setting per week. Further, fall semester student teachers spent nearly two hours more per week in school than did their spring semester peers.

Spring semester students also devoted more time to supervising students’ SAEs than their fall semester counterparts. Nearly one–half hour more per week was devoted to supervising SAEs. Talbert et al. (2005) concluded, “To experience something, an individual must be actively involved in sensing it or making it happen” (p. 417). Regardless of semester taught, all student teachers were afforded opportunities to supervise student SAEs; albeit, the amount of time spent varied. Moreover, these experiences were limited primarily to the entrepreneurship category.

Recommendations for Practice

The findings of this study have implications for student advising. Students should be made aware that student teachers spend approximately the same amount of time teaching regardless of semester. Practically, no difference existed in the amount of time student teachers spent conducting various activities related to teaching regardless of the semester in which they student taught (i.e., fall or spring). However, because fall semester student teachers are “in school” an extra two hours per week as opposed to spring student teachers, the opportunity to observe mentors in formal educational settings and understand their daily routines and functions in school is enhanced (Coplin, 2003). And, because of the time spring student teachers spend outside of school, they should be encouraged to observe their mentors purposefully in a variety of nonformal teaching settings.

Student teachers should supervise a wider variety of SAEs, but they can only supervise the existing SAEs at their cooperating centers. So, in–service workshops should exist for cooperating teachers to encourage and promote a broader range of what SAEs could and perhaps should be facilitated in Oklahoma (Young & Edwards, 2005). Moreover, agricultural industry experts should be queried to further determine the opportunities and future of SAEs in secondary agricultural education programs in Oklahoma (Ramsey, 2009; Ramsey & Edwards, 2010).

Finally, student teachers were only investing roughly two hours per week in the laboratory. So, more emphasis should be placed on preparing student teachers to teach in laboratory settings during their pre–service teacher preparation on campus, and inform cooperating teachers of that expectation.

Recommendations for Further Research

Because a large number of entrepreneurship SAEs were identified, further research should be done to describe better the types of SAEs students are conducting (Baggett-Harlin & Weeks, 2000) and determine if these SAEs are being identified properly. Additionally, a more detailed weekly reporting form should be developed to assist pre–service teachers with improving their reflections when journaling. That may improve related inquiries qualitatively and aid this institution’s teacher preparation faculty in responding to the needs of pre–service teachers in the future regarding their role vis–à–vis students’ SAEs.

Additional studies should assess the topic areas in which student teachers are instructing as they teach across the curriculum. Specifically, a need exists to determine the length of time students spend teaching certain topics. Per this study, the largest amount of student teacher time was devoted to teaching Agriscience I and II as well as Agricultural Power and Technology. However, this research failed to denote the amount of time given to independent units and lessons within a particular course. Further investigations should attempt to determine which topics student teachers instruct and the amount of time spent doing such.

Finally, in part, this study sought to determine which areas of the curriculum student teachers taught. Further studies should focus on the amount of content integration student teachers experience. For example, how often do student teachers integrate math and science into the curriculum? How often are instructional technologies used as tools for teaching secondary agricultural education? More emphasis should be placed on instructing pre–
service teachers as to the importance of documenting time spent integrating technical content into the agricultural education curriculum (Harris & Birkenholz, 1996; Myers & Dyer, 2004; Parr et al., 2009; Warnick, Thompson, & Gummer, 2004; Young et al., 2009).

Implications and Discussion

The spring semester is a busy time of year in Oklahoma. Activities such as the state FFA convention, state FFA interscholastics (i.e., CDEs), state livestock exposition and various preliminary CDEs occur during the spring semester. The fact that the spring semester is “congested” or “overloaded” with FFA activities may explain why fall student teachers spent more time observing their mentors, teaching, and being “in school” when compared to their spring student teaching counterparts. However, spring student teachers may be observing nonformal learning opportunities more (i.e., FFA events and SAE activities) than fall student teachers. So, the question becomes, “What is the ‘magic number’ of hours student teachers should teach and observe in both formal and nonformal settings during student teaching?”

Roberts (2006) noted that the secondary agricultural education curriculum is meant to be hands–on and experiential in nature. Accordingly, it stands to reason that laboratory instruction is an important experience for student teachers because of the opportunity to allow students to apply concepts learned in the classroom. But how much is sufficient?

In regard to time spent in and out of school, it should be noted that one full week of the 12–week student teaching experience in the spring semester was devoted to spring break. So, spring student teachers are afforded one–week less of formal teaching experiences than fall student teachers. This may explain why spring student teachers recorded less time in school than their fall counterparts. However, most years in Oklahoma, spring break coincides with the state’s livestock exposition; so, out of class or nonformal teaching opportunities are provided.

When assessing student teachers’ SAE supervision contacts, their experiences suggest that cooperating teachers have not been enlightened sufficiently on the possibilities of students conducting placement and exploratory SAEs. If so, this may be why student teachers are not gaining experience in these areas. Further, the large number of entrepreneurship SAEs reported here may be due to a strong emphasis on the exhibition of livestock by FFA youth in Oklahoma.

References


J. SHANE ROBINSON is an Assistant Professor in the Department of Agricultural Education, Communication and Leadership at Oklahoma State University, 451 Agricultural Hall, Stillwater, OK 74078–6032. shane.robinson@okstate.edu

SHEYENNE KRYSHER is a Graduate Student in the Department of Agricultural Education, Communication and Leadership at Oklahoma State University, 451 Agricultural Hall, Stillwater, OK 74078–6032. sheyenne.krysher@okstate.edu

J. CHRIS HAYNES is a Graduate Student in the Department of Agricultural Education, Communication and Leadership at Oklahoma State University, 451 Agricultural Hall, Stillwater, OK 74078–6032. chris.haynes@okstate.edu

M. CRAIG EDWARDS is a Professor in the Department of Agricultural Education, Communication and Leadership at Oklahoma State University, 451 Agricultural Hall, Stillwater, OK 74078–6032. craig.edwards@okstate.edu