Journal of Agricultural Education
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Volume 58, Issue 4, 2017

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(Terms end on December 31)

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Analyzing the Relationship between Four Teacher Competence Areas and Commitment to Teaching

Aaron J. McKim¹, Tyson J. Sorensen², Jonathan J. Velez³, & Thomas M. Henderson⁴

Abstract

The success of education depends on highly competent teachers committed to stay in the teaching profession. In agricultural education, the need for teachers committed to teaching agriculture is heightened by the identified shortage of teachers. Previous research has linked teacher competence, most commonly operationalized as self-efficacy, and commitment to teaching. However, research has not explored the relationship between specific teacher competence areas in agricultural education and commitment to teaching. In this study, we explored the relationship between four discipline-specific competence areas (i.e., intra-curricular facilitation, pedagogy, program management, and technical knowledge) and commitment to teaching among school-based agriculture teachers. First, teacher competence in the four areas were compared by career phase, with statistically different levels of intra-curricular facilitation competence identified among teachers with varying levels of teaching experience. Therefore, career phase was included when analyzing the relationship between teacher competence and commitment to teaching. The final model, predicting commitment to teaching, was statistically significant. One of the four competence areas, technical knowledge, was identified as a statistically significant, positive predictor of commitment to teaching. The findings are discussed along with implications for teacher education and recommendations for further research.

Keywords: commitment to teaching; intra-curricular facilitation; pedagogy; program management; technical knowledge

Introduction and Theoretical Framework

Recruiting and retaining highly competent teachers is one of the foundational objectives of the agricultural education profession (Foster, Lawver, & Smith, 2014; Myers, Dyer, & Washburn, 2005). In this study, we focused on the retention of school-based agricultural education (SBAE) teachers. More specifically, this exploratory research analyzed the relationship between perceived competence and commitment to remain teaching agriculture. This analysis was conducted to provide critical insight into variables which influence the retention of current SBAE teachers.

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The need for research into the commitment of SBAE teachers to remain teaching agriculture, henceforth referred to as commitment to teaching, stems from the vulnerability of SBAE to a “significant shortage of qualified teachers” (Kantrovich, 2010, p. 43). A shortage of teachers limits the growth and positive impact of SBAE. The need for more teachers is not exclusive to SBAE, with many disciplines facing a teacher shortage (Grissmer & Kirby, 1987; Ingersoll, 2001; Shen, 1998). Efforts to understand the broad-reaching teacher shortage can be seen in a growing body of literature exploring why teachers leave teaching. Consistently, two variables influence the decision of teachers to leave the profession: (a) individual teacher characteristics - e.g., teacher competence and (b) career stage (Grissmer & Kirby, 1987; Ingersoll, 2001; Shen, 1998).

Throughout education, interest is high in exploring and understanding the ramifications of teacher competence (Roelofs & Sanders, 2007). Existing research details competent teachers have the requisite knowledge and skills to produce desired student learning outcomes (Medley & Shannon, 1994; Mulder, Weigel, & Collins, 2006) and are better able to facilitate an environment conducive to learning (Mulder et al., 2006; Roelofs & Sanders, 2007; Woolfolk Hoy, 2000). Beyond detailing advantages of competent teachers, existing literature distinguishes competence and competency. Teacher competence describes a broad category of teaching whereas a teacher competency refers to a specific teaching skill nestled within an area of teacher competence. SBAE requires teachers with a broad range of competencies in multiple competence areas (De Lay & Washburn, 2013; Phipps, Osborne, Dyer, & Ball, 2007). Essential competence areas for SBAE teachers include intra-curricular facilitation, pedagogy, program management, and technical knowledge. While there are additional competence areas required of SBAE teachers, this research focused on the four identified competence areas.

Intra-curricular facilitation competence includes the knowledge of, and ability to, structure FFA and Supervised Agricultural Experience (SAE) opportunities to enhance student learning. Within intra-curricular facilitation, many individual competencies emerge, for example, training career development teams. Pedagogical competence refers to connecting classroom strategies to the needs of students while encouraging student achievement of identified learning outcomes. Managing student behavior is one example competency within pedagogical competence. Program management competence entails facilitating the broad range of experiences within an SBAE program. Program management competencies include planning field trips, utilizing an advisory committee, and conducting adult programs. Finally, technical competence refers to the requisite knowledge and skills to offer the broad range of SBAE courses. As an example, teaching animal science would be a competency within the domain of technical competence.

The purpose of this study was to explore the relationship between competence and commitment to teaching among SBAE teachers. The theoretical foundation for the relationship between competence and commitment to teaching is rooted in self-efficacy research (Bandura, 1977, 1986). Self-efficacy is operationalized as an individual’s confidence in his or her ability to successfully accomplish a given task. Furthermore, efficacious individuals (i.e., those with higher competence) are more likely to perceive challenges associated with a task as surmountable, and therefore, perceive more commitment to continue doing the task (Bandura, 1986; Coladarci, 1992). Alternatively, individuals with lower self-efficacy (i.e., those with lower competence) tend to have less commitment to continue a task because they are unsure of their abilities to overcome expected challenges. Accordingly, SBAE teachers who perceive higher competence within the identified areas should also perceive a higher commitment to teaching (see Figure 1).
Figure 1. Conceptual model of the relationship between competence and commitment to teaching.

Literature Review

In this literature review, we explored the diverse nature of SBAE teacher competence and commitment to teaching. Specifically, three prevalent categories are reviewed: (a) teacher competence, (b) commitment to teaching, and (c) the relationship between teacher competence and commitment to teaching.

Teacher Competence

Within teacher competence literature, two areas of SBAE research (i.e., needs assessments and teacher self-efficacy) offered relevant insights. Needs assessments evaluate the importance and competence teachers perceive within a variety of relevant competencies to identify potential professional development topics (Borich, 1980). Analyzing needs assessment research helps identify specific competencies and competence areas to include in our analysis of SBAE teacher competence. Additionally, self-efficacy research extends our understanding of teacher competence by measuring teachers’ “judgment of [their] capabilities to bring about desired outcomes” (Tschannen-Moran & Woolfolk Hoy, 2001, p. 783).

Four teacher competence area themes emerged from existing SBAE needs assessment research: (a) pedagogy, (b) intra-curricular facilitation, (c) program management, and (d) technical knowledge. Within pedagogy, common competencies have included motivating students to learn (Duncan, Ricketts, Peake, & Uesseler, 2006; Garton & Chung, 1996), managing student behavior (Duncan et al., 2006; Sorensen, Tarpley, & Warnick, 2010), teaching students with special needs (Duncan et al., 2006; Sorensen et al., 2010), and using technology as a teaching tool (Edwards & Briers, 1999; Garton & Chung, 1996; Joerger, 2002; Layfield & Dobbins, 2002). For intra-curricular facilitation, identified competencies include facilitating recordkeeping learning (Duncan et al., 2006; Layfield & Dobbins, 2002; Sorensen, Lambert, & McKim, 2014; Sorensen et al., 2010), completing FFA or proficiency award applications (Duncan et al., 2006; Garton & Chung, 1996; Layfield & Dobbins, 2002; Sorensen et al., 2010), and supervising or developing SAE opportunities for students (Duncan et al., 2006; Garton & Chung, 1996; Layfield & Dobbins, 2002; Sorensen et al., 2010). Within program management, competencies have included developing effective public relations (Duncan et al., 2006; Garton & Chung, 1996; Layfield & Dobbins, 2002), utilizing advisory committees (Duncan et al., 2006; Garton & Chung, 1996; Sorensen et al., 2014;
Sorensen et al., 2010), managing adult education programs (Edwards & Briers, 1999; Garton & Chung, 1996; Layfield & Dobbins, 2002), and completing reports and programmatic paperwork (Garton & Chung, 1996; Layfield & Dobbins, 2002). Finally, within technical knowledge, common competencies have included teaching biotechnology (Duncan et al., 2006), veterinary technology (Duncan et al., 2006), agricultural mechanics (Sorensen et al., 2014), and agribusiness (Layfield & Dobbins, 2002).

Needs assessment research in SBAE provides insight into competence areas and specific competencies to include in the current study. In addition to needs assessment research, studies exploring teacher self-efficacy, a concept closely linked to teacher competence, provide a foundation for understanding the confidence of SBAE teachers in discipline-specific areas. Duncan and Ricketts (2006) analyzed SBAE teacher self-efficacy in technical content knowledge, FFA/SAE/Leadership Development, program management, and teaching and learning, finding traditionally certified teachers most efficacious in program management and alternatively certified teachers most efficacious in teaching and learning. Similarly, Wolf (2008, 2011) and Hartfield (2011) evaluated discipline-specific areas of teacher self-efficacy, using FFA, SAE, and classroom categories. Research conducted by Wolf and Hartfield suggests SBAE teachers were most efficacious in the classroom domain and least efficacious in SAE. In the current study, like existing self-efficacy research (Duncan & Ricketts, 2006; Hartfield, 2011; Wolf, 2008, 2011), we explored discipline-specific domains, framed as competence areas. We selected competence areas based on themes found within SBAE needs assessment research representing important elements of SBAE teacher success. Selected themes included pedagogy, intra-curricular facilitation, program management, and technical knowledge.

Commitment to Teaching

Commitment to teaching is vital to reducing teacher turnover, implementing curricular innovations, enacting change within a discipline, maintaining program continuity, sustained success, and enhancing the depth of student development (Firestone & Pennell, 1993; Hausman & Goldring, 2001; Ingersoll & May, 2010; Robinson & Edwards, 2012). Research has identified a noteworthy range of variables which influence commitment to teaching (e.g., classroom management, curriculum delivery competence, work-life balance, and classroom organization issues), highlighting the need for research exploring the relationship between multiple competence areas and commitment to teaching (McKim & Velez, 2016; Mee & Haverback, 2014; Sorensen & McKim, 2014).

Analyses of commitment to teaching in SBAE are spurred by teacher retention challenges, especially among early-career teachers (De Lay & Washburn, 2013; Foster et al., 2014). Broader education literature has identified a quarter of teachers leave teaching within the first two years and up to half leave within the first five years (Ingersoll & Smith, 2003). In SBAE, national studies of commitment to teaching have found only one-third of first year teachers report being “highly likely” to continue teaching SBAE beyond five years (Warnick, Thompson, & Tarpley, 2010). The first five years of teaching SBAE can be described as a gauntlet of challenges (Myers et al., 2005; Osborne, 1992), requiring knowledge and skills in a broad range of competence areas to maintain a commitment to teaching SBAE.

Relationship between Teacher Competence and Commitment to Teaching

Enhancing commitment to teaching is a complex endeavor (Ingersoll, 2001) requiring coordinated efforts from multiple stakeholders. In this study, we explored teacher competence, and the relationship between teacher competence and commitment to teaching, to evaluate the role
discipline-specific competence areas play in the commitment to teaching of SBAE teachers. However, we were not the first to explore the links between competence and commitment in SBAE. Using foundations of self-efficacy (Bandura, 1977, 1986), SBAE research has consistently linked higher teacher self-efficacy with increased commitment to teaching (Blackburn & Robinson, 2008; Knobloch & Whittington, 2003; McKim & Velez, 2015; Swan, 2005; Wheeler & Knobloch, 2006). Existing literature, however, is limited in the variables of self-efficacy studied, as research has yet to explore discipline-specific areas in relation to commitment to teaching. We sought to address this gap by evaluating SBAE teacher competence in discipline-tailored constructs of pedagogy, intra-curricular facilitation, program management, and technical knowledge as well as the relationship between competence areas of commitment to teaching.

**Purpose and Research Objectives**

Understanding the relationship between SBAE-specific areas of teacher competence and commitment to teaching is an important next step for SBAE literature. In this study, we sought to elucidate the relationship between teacher competence and commitment to teaching by analyzing competence in intra-curricular facilitation, pedagogy, program management, technical knowledge, and SBAE teachers’ commitment to teaching. More specifically, the following research objectives guided the development and execution of our research:

1.) Describe the sample of agriculture teachers.
2.) Describe SBAE teachers’ perceived competence in intra-curricular facilitation, pedagogy, program management, and technical knowledge by career phase.
3.) Describe SBAE teachers’ commitment to teaching by career phase.
4.) Evaluate the relationship between teacher competence and commitment to teaching.

**Methods and Procedures**

The population for this research included all Oregon SBAE teachers ($N = 111$) during the 2013-2014 school year. Contact information was obtained from the Oregon Agriculture Teacher Directory and vetted by a panel of SBAE experts. A census of potential respondents was attempted via an electronic, Qualtrics survey. Non-respondents were contacted up to five times including four e-mail follow-ups and subsequent phone calls to a random sample of non-respondents (Dillman, 2007; Lindner, Murphy, & Briers, 2001; Miller & Smith, 1983). A total of 80 usable responses ($n = 80$) were collected, for a usable response rate of 72%. On-time respondents (i.e., respondents prior to the fourth contact attempt) were compared to late respondents (i.e., respondents after the fourth contact attempt) using an independent samples $t$-test to compare the variables of interest. No statistically significant differences were observed, therefore, respondents were treated as a sample of the research population (Linder et al., 2001; Miller & Smith, 2003).

**Instrumentation**

Face and content validity of the research instrument were evaluated by a panel of SBAE experts with over 50 years of collective teaching and research experience. Constructs within the survey included commitment to teaching, intra-curricular facilitation competence, pedagogical competence, program management competence, and competence in technical knowledge. Post-hoc reliability estimates were conducted (i.e., intra-curricular facilitation competence $\alpha = .85$; pedagogical competence $\alpha = .82$; program management competence $\alpha = .86$; competence in technical knowledge $\alpha = .77$; and commitment to teaching $\alpha = .84$) with constructs exceeding minimum, Cronbach’s alpha reliability standards (Nunnally & Bernstein, 1994).
The commitment to teaching construct was developed from the eight-item, professional commitment scale, a measure designed to evaluate an individual’s identity with, and value toward, his or her selected profession (Blau, 1985). Professional commitment has been shown to reliably predict teacher turnover (Blau, 1985, 1988, 1989; Chapman, 1983; Raju & Srivastava, 1994; Singh & Billingsley, 1996). In this study, professional commitment was operationalized as commitment to teaching, and was measured on a seven-point scale, ranging from 1 “Strongly Disagree” to 7 “Strongly Agree.”

The four constructs measuring competence areas (i.e., intra-curricular facilitation, pedagogy, program management, and technical knowledge) were developed as part of a larger study. Individual items (i.e., competencies) were derived from previous literature (Boone & Boone, 2007; Duncan et al., 2006; Garton & Chung, 1996; Layfield & Dobbins, 2002; Mundt & Connors, 1999; Myers et al., 2005; Sorensen et al., 2010) and concatenated into four competence areas by the researchers. Items were measured on a five-point scale, ranging from 1 “Very Low” to 5 “Very High,” with higher scores indicating additional perceived competence. Within intra-curricular facilitation, respondents were asked to rate their competence offering FFA and SAE activities. Sample competencies included “training CDE teams” and “supervising students’ SAE programs.” Pedagogical competence evaluated SBAE teachers’ competence using classroom teaching methods. Sample competencies included “teaching with experiments,” “evaluating student performance,” and “managing student behavior.” Program management competence evaluated overall management of an SBAE program. Sample items included perceived ability “utilizing a local advisory committee,” “maintaining agricultural equipment,” and “recruiting students.” Finally, competence in technical knowledge evaluated perceived ability teaching different technical areas of agriculture. Sample items included “teaching agribusiness” and “teaching about public issues regarding agriculture.”

Data Analysis

Following collection, data were imported into the Statistical Package for the Social Sciences (SPSS) for analysis. Research objective one was completed using frequencies, means, and percentages. Objectives two and three, which sought to describe competence and commitment to teaching by career phase, were completed by grouping first through fifth year SBAE teachers (i.e., early-career), teachers with six to 19 years of teaching experience (i.e., mid-career), and teachers with 20 or more years of teaching experience (i.e., late-career). Competence and commitment to teaching were evaluated by career phase due to the importance of career phase in studies of teacher competence and commitment (Ingersoll, 2001). One-way analysis of variances (i.e., ANOVA) compared the competence and commitment to teaching of the three identified groups. Effect sizes were also calculated, with established criteria set at “small effect,” \( \eta = .100 \); “medium effect,” \( \eta = .243 \); and “large effect,” \( \eta = .371 \) (Cohen, 1988). Statistical significance was established a priori at \( p \)-value < .05.

In research objective four, we sought to describe the relationship between perceived competence and commitment to teaching. A simultaneous entry, multiple linear regression was used in which the four competence areas and career stage were independent variables predicting commitment to teaching. Within the findings, standardized betas for each independent variable and an overall model \( R^2 \) are reported. Throughout our discussion, we make no attempt to generalize the findings beyond the population of Oregon agriculture teachers during the 2013-2014 school year.
Findings

Respondents to this study included a slight majority of male teachers ($f = 44$; 55.70%). The average age of respondents was just over 38 ($M = 38.28$), with a range from 23 to 65 years old. A majority of respondents had been traditionally certified in SBAE ($f = 66$; 83.50%). For career phase, the largest group were mid-career teachers (i.e., teachers with 6-19 years of teaching experience; $f = 33$; 44.00%), followed by early-career (i.e., first through fifth year teachers; $f = 27$; 36.00%) and late-career teachers (i.e., teachers with 20 or more years of teaching experience; $f = 15$; 20.00%).

The second and third research objectives focused on intra-curricular facilitation, pedagogy, program management, and technical knowledge competence (i.e., research objective two) and commitment to teaching (i.e., research objective three) by career phase (see Table 1). Significant differences in perceived competence or commitment to teaching would warrant inclusion of the career phase variable as a control within the relationship between teacher competence and commitment to teaching.

Table 1

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<th>Variables</th>
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</table>

Note. Means with different superscripts in each row are significantly different at $p < .05$ based on Scheffe post-hoc test for unequal variances. Teacher competence items scaled from 1 “Very Low” to 5 “Very High.” Commitment to teaching items scaled from 1 “Strongly Disagree” to 7 “Strongly Agree.” Early-career teachers included those in their first through fifth year of teaching, mid-career teachers were those with six to 19 years of experience, and late-career teachers included teachers with 20 or more years of experience.

Respondents with the most teaching experience perceived the highest competence in intra-curricular facilitation ($M = 3.43$), pedagogy ($M = 3.53$), program management ($M = 3.49$), and technical knowledge ($M = 3.29$). Early-career teachers perceived the lowest teacher competence in three of the four areas, with the one exception being technical knowledge. Overall, respondents perceived the highest competence in pedagogy ($M = 3.50$) followed by program management ($M = 3.28$), technical knowledge ($M = 3.21$), and intra-curricular facilitation ($M = 3.10$). Comparing competence by career phase using ANOVA yielded statistically insignificant differences in pedagogy ($F = 0.37; p$-value = .694), program management ($F = 2.04; p$-value = .138), and technical knowledge ($F = 0.30; p$-value = .742). However, statistically significant differences were identified within intra-curricular facilitation ($F = 3.50; p$-value = .036) based on career phase. Post-hoc analysis revealed a medium difference (Cohen, 1988) between early-career teachers ($M = 2.96$) and late-career teachers ($M = 3.43; η = .30$) with respect to intra-curricular facilitation competence.
Transitioning to commitment to teaching, late-career teachers perceived the highest commitment to teaching \((M = 5.33)\) followed by early-career \((M = 5.04)\) and mid-career \((M = 4.83)\) SBAE teachers. However, a comparison using ANOVA revealed these differences were statistically insignificant \((F = 0.98; p\text{-value} = .380)\).

The final research objective sought to evaluate the relationship between teacher competence and commitment to teaching (see Table 2). Five independent variables were analyzed in relation to commitment to teaching. Independent variables included competence in intra-curricular facilitation, pedagogy, program management, and technical knowledge. Additionally, career phase was included to control for the statistically significant differences in intra-curricular facilitation by career phase (Cohen & Cohen, 1983).

Table 2

Relationship between Teacher Competence and Commitment to Teaching

<table>
<thead>
<tr>
<th>Variables</th>
<th>Zero-order correlation ((r))</th>
<th>(p\text{-value})</th>
<th>(B)</th>
<th>(SEB)</th>
<th>(\beta)</th>
<th>(p\text{-value})</th>
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</thead>
<tbody>
<tr>
<td>Intra-Curricular Facilitation</td>
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<td>.026</td>
<td>-.23</td>
<td>.34</td>
<td>-.12</td>
<td>.502</td>
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<tr>
<td>Pedagogy</td>
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<td>.008</td>
<td>.02</td>
<td>.40</td>
<td>.01</td>
<td>.962</td>
</tr>
<tr>
<td>Program Management</td>
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<td>.007</td>
<td>.40</td>
<td>.35</td>
<td>.18</td>
<td>.248</td>
</tr>
<tr>
<td>Technical Knowledge</td>
<td>.39</td>
<td>&lt;.001</td>
<td>.84</td>
<td>.41</td>
<td>.36</td>
<td>.045</td>
</tr>
<tr>
<td>Career Phase</td>
<td>.06</td>
<td>.586</td>
<td>.06</td>
<td>.18</td>
<td>.04</td>
<td>.754</td>
</tr>
</tbody>
</table>

Note. \(R = .41, R^2 = .17, F = 2.71, p\text{-value} = .027\). Teacher competence items scaled from 1 “Very Low” to 5 “Very High.” Early-career teachers included those in their first through fifth year of teaching, mid-career teachers included those with six to 19 years of teaching experience, and late-career teachers included those with 20 or more years of teaching experience. Commitment to teaching items scaled from 1 “Strongly Disagree” to 7 “Strongly Agree.”

In combination, independent variables established a statistically significant model of commitment to teaching \((F = 2.71; p\text{-value} = .027)\) which explained 17% \((R^2 = .17)\) of the variance in commitment to teaching. One of the predictors (i.e., technical knowledge) was a statistically significant, positive predictor of commitment to teaching \((\beta = .36; p\text{-value} = .045)\) after accounting for the other predictors in the model. Three of the four remaining independent variables were statistically insignificant, positive predictors of commitment to teaching, with the one exception being intra-curricular facilitation, which was a statistically insignificant, negative predictor of commitment to teaching \((\beta = -.12; p\text{-value} = .502)\).

Conclusions and Recommendations

Teacher competence is an important variable to teacher success and retention in the teaching profession (Blackburn & Robinson, 2008; Knobloch & Whittington, 2003; McKim & Velez, 2015; Swan, 2005; Wheeler & Knobloch, 2006). In this study, we sought to extend current knowledge on SBAE teacher competence by exploring discipline-specific competence areas and
the relationship between competence and commitment to teaching. In research objective one, we examined the demographics of responding teachers. The results revealed a fairly heterogeneous group of teachers who represented multiple phases of the SBAE teaching career. Demographic information was provided to allow readers to compare the sample of teachers in this study to agriculture teacher populations outside our frame.

The second and third research objectives described teacher competence and commitment to teaching by career phase with findings suggesting more experienced teachers perceive higher competence and commitment to teaching. These findings are what we would hope and expect from seasoned teachers; however, we recognize the potential for respondent mortality to influence results (i.e., only teachers with high competence and commitment being retained in the profession). Digging deeper into the findings on teacher competence, it was interesting to note pedagogical competence was most similar across the three career phases. The stability of pedagogy over time may belie a lack of pedagogical growth as teachers mature in their careers. Within SBAE, one effort to enhance pedagogy was the Delta Conference. The outcomes of the Delta Conferences revealed teachers engaged in a sustained, intensive pedagogical professional development perceived sizable growth in pedagogical competence (Coonrod, McGregor, & Bellah, 2009; McGregor, Bellah, & Coonrod, 2008). Therefore, we recommend teacher educators explore opportunities to encourage the pedagogical growth of teachers throughout their careers via opportunities like Delta.

In addition to similar pedagogical competence across career phases; we note statistically different levels of intra-curricular facilitation competence for early and late-career phase teachers. In contrast to pedagogical competence, these findings suggest SBAE teachers develop intra-curricular competence as they continue in their careers. The aforementioned challenges faced by early-career SBAE teachers (Myers et al., 2005; Osborne, 1992) paired with comparatively low competence structuring FFA and SAE opportunities may result in early-career SBAE teacher attrition. As an intervention, teacher educators are encouraged to provide additional support to early-career teachers with regard to balancing early-career challenges and intra-curricular facilitation.

Focusing on commitment to teaching, statistically insignificant differences were found between early, mid, and late-career teachers with higher reported commitment among teachers early and late in their careers. Similar patterns have been observed in broader education literature regarding work-related self-efficacy, a concept closely linked to commitment to teaching (Klassen & Chiu, 2010). Research suggests young teachers have youthful exuberance, and perhaps an excitement to be in a new profession, which supports a higher commitment to teaching. Additionally, late-career teachers may feel some measure of commitment based on nearness to retirement. Lower commitment to teaching among mid-career teachers suggests mid-career is a pivotal stage in which teachers decide to remain or exit the profession. We recommend teacher educators consider providing professional development opportunities for mid-career teachers. Anecdotally it seems many teacher development programs provide early-career teacher workshops and trainings. While this is critical, our findings warrant consideration for interventions to enhance commitment to teaching among mid-career teachers.

The final research objective evaluated the relationship between teacher competence and commitment to teaching. Technical competence, defined as knowledge and abilities related to the broad range of agricultural course offerings, was the only statistically significant predictor of commitment to teaching. The significant relationship between technical competence and commitment to teaching suggests teachers with more competence in the material they teach are more committed to remain in teaching. Furthermore, the link between technical competence and commitment to teaching bridges teacher competence literature and the theory of self-efficacy. Pre-
service teachers engaged in additional mastery (i.e., opportunities to interact with and teach technical material) and vicarious (i.e., opportunities to observe others teach and interact with technical material) experiences during teacher education programs should experience increased technical competence (Bandura, 1986, 1997). Teacher education programs must ensure preservice teachers have access to these essential technical competence building experiences.

One of the puzzling aspects of the relationship between competence and commitment to teaching was the role of intra-curricular facilitation. While statistically insignificant, we did wonder when intra-curricular facilitation emerged as a negative predictor of commitment to teaching. Prior literature highlights SBAE teachers exhibit high professional development needs related to FFA (Layfield & Dobbins, 2002) and have lower self-efficacy in offering SAE (Wolf, 2008). Given the challenges of FFA and SAE facilitation, especially among early-career teachers, additional research should examine the manner in which intra-curricular facilitation relates to commitment to teaching among early-career teachers. Unfortunately, a limited sample of early-career teachers precluded this analysis in our research. However, if future research supports a negative relationship between intra-curricular facilitation and commitment to teaching among early-career teachers, scholars are encouraged to consider examining work-family balance as a potential confounding variable.

The current study provides an initial examination of four teacher competence areas and commitment to teaching, however, further research is needed. We now have empirical evidence that technical competence is a significant predictor of commitment to teaching and we are able to evaluate, from a practical sense, the relationships between commitment to teaching and pedagogical competence, program management competence, and intra-curricular facilitation. While there is difficulty in examining the complexities of teacher retention, we need to be persistent in researching the many variables that comprise commitment to teaching.

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Assessing Tennessee Livestock Producers' Awareness, Attitudes, and Perceptions of Right-of-Way Hay Harvesting

Sarah Joy F. Greer1, Christopher T. Stripling2, Andrew P. Griffith3, & Carrie Ann Stephens4

Abstract

Tennessee Statute 54-5-134, Cutting Hay Along Controlled Access Highway Right-of-Way, provided agriculturalists the right to harvest hay along interstate highways’ and other controlled access roads’ medians and shoulders. Maintenance of these medians and shoulders are routinely contracted to private mowing companies and funded by Tennessee taxpayers. As a result of the Tennessee statute and lack of empirical information, a questionnaire was used to assess livestock producers’ awareness, attitudes, and barriers concerning right-of-way hay harvesting. We found 7.2% of surveyed livestock producers were aware of their right to this resource, but none of the producers had applied for a permit. While livestock producers were highly innovative in terms of general agricultural practices, they were moderate in attitude towards right-of-way hay harvesting. Attributes leading to a more positive attitude toward right-of-way hay harvest were: (a) the ability to sell hay harvested from right-of-ways, (b) willingness to pay someone else to cut hay from right-of-ways, and (c) currently purchasing hay. Alternatively, an attribute leading to a more negative attitude was currently feeding alfalfa mix hay. There is moderate interest among livestock producers to utilize hay from right-of-ways, but further research and education is needed to explore the practicality of this innovation.

Keywords: Right-of-way, hay, innovation, livestock

Kiers et al. (2008) professed agriculture is at a crossroad, and innovation is going to direct agriculture into the future success the world needs. Correspondingly, the American Association for Agricultural Education’s 2016-2020 National Research Agenda underscored the importance of agricultural innovation and adoption and listed the study of new technologies, practices, and products adoption decisions as one of seven research priority areas (Roberts, Harder, & Brashears, 2016). According to Lindner, Rodriguez, Strong, Jones, and Layfield (2016), “additional research on and a better understanding of new technologies, practices, and products will help agricultural educators develop and implement agricultural teaching and learning processes contributing to the development of sustainable agricultural systems needed in the future” (p. 20). Linder et al. also

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professed this research requires agricultural education to have an outward focus on farmers and political and social systems.

With that in mind, efficient resource allocation is imperative among agriculturalists due to an impending population boom projected to be over 9 billion by 2050 (Food and Agriculture Organization of the United Nations [FAO], 2009). Impending challenges, brought on by new population growth, are unique to this generation, and these challenges are so complex and multifaceted that one solution will not solve the issue (Godfray et al., 2010). Historically, agricultural growth has always met and surpassed demands set by an ever-growing population, largely due to land acquisition and increased production from biological, chemical, and technological advances (Alexandratos & Bruinsma, 2012; Federico, 2005). However, due to various factors of urbanization, protected land, erosion, and nutrient depletion, “the amount of arable land available globally fell from 0.39 hectares per person in 1960 to 0.21 hectares in 2007” (Evans, 2010, p. 12). Therefore, instead of acquiring new farmland (Alexandratos & Bruinsma, 2012), agriculture will have to seize new innovations, technologies, and ideas to see the same success of previous generations (Federico, 2005).

Right-of-way hay harvesting may be part of the solution to increasing land use efficiency. Prior researchers have suggested instead of leaving roadside grass cuttings to mulch, the cuttings should be removed and used for purposes such as hay, compost, or biogas material (Cherney, Johnson, Petritz, & Sinha, 1990; Piepenschneider et al., 2016; Montgomeryshire Wildlife Trust [MWT], 2006). Cherney et al. (1990) determined hay harvesting from right-of-ways was feasible as long as location specific challenges were overcome. Furthermore, recruiting farmers to harvest the vegetation could be economically advantageous (Cherney et al., 1990) and potentially environmentally responsible with the removal of clippings (Parr & Way, 1988). In a report detailing the most beneficial vegetation management procedures, the Minnesota Department of Transportation (2008) stated haying right-of-ways contributes to a decrease in maintenance fees and is considered, in moderation, a “viable option” (p. 70).

Additionally, hay surpluses are vital to stable agricultural economics due to the impact of unforeseen events like drought (Coppock, 2011). Climate and weather events, such as drought, force agriculturalists to make decisions about livestock herd size in relation to water supply, grazing capacity, livestock sale rates, hay production, and breeding stock (Coppock, 2011). A multi-year drought study in Utah concluded practice and preparedness changed in cattle ranchers after droughts; ranchers became more proactive than reactive (Coppock, 2011). In Austin, Texas, where right-of-way hay harvest is permitted, livestock producers do not participate in right-of-way hay harvesting, because they are wary of the mixture of grass species found on right-of-ways (W. Rehnborg Texas Department of Transportation, personal communication, October 19, 2015). The majority of grass in Tennessee is tall fescue or tall fescue mixed with orchard grass or timothy (Bates, 1999). Cherney et al. (1990) found hay quality varied on right-of-ways; however, the lowest quality hay harvested from right-of-ways in their study was sufficient for mature beef cattle in accordance with standards set by the National Research Council (1984). To that end, Botterill and Mazur (2004) found risk perceptions are often over-exaggerated by the farming community, and this may be caused by farmers having a nature of being risk averse, which can often be attributed to many factors including lack of knowledge.

The state of Tennessee spends millions of dollars on right-of-way maintenance (State of Tennessee, 2016), but according to Tennessee Statute 54-5-134, Cutting Hay Along Controlled Access Highway Right-of-Way, Tennessee farmers are able to petition to harvest hay off of right-of-ways. Permits are available for up to 3 miles or 50 acres of right-of-way vegetation (Tennessee Department of Transportation [TDOT], 2003). However, despite being legal, there is little evidence
Tennessee farmers are aware of their right to harvest hay on right-of-ways. Moreover, no studies were found which explored farmers’ awareness, attitudes, or barriers regarding right-of-way hay harvesting. According to L. South (personal communication, February 12, 2015), an assistant general counsel in region two of TDOT, there has been one permit applied for to harvest hay on right-of-ways in the last six years. With pressures to increase efficiency and sustainability in agriculture and state resources, this study will seek to understand livestock producers’ views of Tennessee Statute 54-5-134 and conduct economic impact analyses to determine producers’ willingness to harvest hay from right-of-ways.

**Theoretical Framework**

Rogers’ (2003) theory of diffusion of innovations served as the theoretical framework of this study. The adoption and utilization of a new idea or process is difficult to diffuse through a society, even if there are clear advantages (Rogers, 2003). Not every invention or new idea is readily accepted as a norm (Rogers, 2003). “Innovation is more than an invention. Success is not based on technological performance in isolation, but rather how [it] builds knowledge, networks and capacity” (Kiers et al., 2008, p. 321). Therefore, understanding how people respond to and accept innovation is the key to ensuring its speed in adoption and longevity in success (Rogers, 2003).

Diffusion researchers throughout the years have arrived at very similar steps, thus the innovation-decision process was developed (Rogers, 2003). The innovation-decision process outlines the essential steps to carry a potential adopter from initial knowledge to adoption or rejection of an innovation, and the process is composed of five stages that flow into each other— the completion of one step leads to the subsequent stage (Rogers, 2003). The stages are as follows: (a) knowledge, (b) persuasion, (c) decision, (d) implementation, and (e) confirmation (Rogers, 2003). With the aid of communication channels, an individual is able to transform into the next stage (Rogers, 2003). Duration of the innovation-decision process is dependent on the classification of the adopter and how quickly an individual adopts an innovation (Rogers, 2003). Rogers (2003) classified adopters as (a) innovators, (b) early adopters, (c) early majority, (d) late majority, and (e) laggards.

In order for one to persist through the innovation-decision process, an individual must acquire awareness or knowledge of an innovation (Rogers, 2003). The knowledge stage technically begins “when an individual (or other decision-making unit) is exposed to an innovation’s existence and gains an understanding of how it functions” (Rogers, 2003, p. 171). Initial awareness may be a passive act, but typically, more detailed learning is active and is dependent on the following prior conditions: (a) previous practice, (b) felt needs/problems, (c) innovativeness, and (d) norms of the social systems (Rogers, 2003).

Following the acquisition of awareness and knowledge of an innovation, the adopter moves forward by developing either a positive or negative attitude during the persuasion stage (Rogers, 2003). An attitude, as defined by Rogers (2003), “is a relatively enduring organization of an individual’s beliefs about an object that predisposes his or her actions” (p. 175). The information transforms from a purely cognitive state of the knowledge stage to being more active and affectionate, or a feeling (Rogers, 2003). Attitude development can be influenced by “(1) relative advantage, (2) compatibility, and (3) complexity” (Rogers, 2003, p. 175).

Once an attitude has been formulated based on advantages and disadvantages of the innovation in the potential adopter’s viewpoint, the process continues onto an active decision stage (Rogers, 2003). As outlined by Rogers (2003), an individual may choose to adopt the innovation,
which is “a decision to make full use of an innovation as the best course of action available” (p. 177) or reject the innovation, which is “a decision not to adopt an innovation” (p. 177). Rejection of the innovation can occur at any point in the process as well in a passive manner, which could simply be exemplified by an individual forgetting that he or she heard of the innovation (Rogers, 2003).

After deciding to adopt the innovation, one moves to the implementation stage, which comes with the first active behavioral change as the innovation is put into actual use (Rogers, 2003). This stage varies in length depending on the innovation and if the adopter is an individual or if they are a group (Rogers, 2003). Re-invention, defined as “the degree to which an innovation is changed or modified by a user in the process of its adoption and implementation” (Rogers, 2003, p. 180), can also occur in this stage. Re-invention is not considered a fault in the innovation, but could add difficulty to tracing the innovation as it diffuses through a population (Rogers, 2003). As for the adopter, re-invention of an innovation could allow the innovation to match individual needs better, thus leading to higher rates of adoption (Rogers, 2003).

Complete adoption of an innovation does not end at the implementation stage as there is an additional information-seeking period following implementation (Rogers, 2003). In the confirmation stage, an individual may seek “reinforcement for the innovation-decision already made, and may reverse this decision if exposed to conflicting messages about the innovation” (Rogers, 2003, p. 189). If an adopter experiences any sort of dissonance, they will seek to lessen or completely avoid it, thus discontinuing the innovation (Rogers, 2003).

**Purpose and Objectives**

The purpose of this study was to assess livestock producers’ current awareness, attitudes, and barriers concerning right-of-way hay harvesting as well as to conduct economic impact analyses to determine producers’ willingness to harvest hay from right-of-ways. The objectives of this study were:

1. Describe current awareness, need, and utilization of Tennessee Statute 54-5-134.
2. Describe perceptions of barriers to participating in right-of-way hay harvesting.
3. Determine if a significant difference exists in attitudes toward agricultural modernization and right-of-way hay harvesting.
4. Determine if there is a difference in the amount livestock producers are willing to spend versus the amount they are willing to pay someone to harvest right-of-way hay.
5. Determine factors impacting willingness to harvest right-of-way hay.

**Methods**

A quantitative research approach was used, and the research design was descriptive survey research, which was exploratory in nature due to limited information available on right-of-way hay harvesting. The target population for this study was livestock producers along Interstate 840 (I-840) in Tennessee. I-840, an interstate bypassing metropolitan Nashville, is accessible by five counties: (a) Hickman, (b) Dickson, (c) Williamson, (d) Rutherford, and (e) Wilson (Haslam & Schroer, 2012). The 77.28-mile bypass originally was designed in 1986 to alleviate Nashville traffic (Haslam & Schroer, 2012). Construction was completed in 2012 to connect I-840 to interchanges of I-40, I-65, and I-24 (Haslam & Schroer, 2012). To build the four lane bypass, 681 tracts of land were purchased, amounting to over 5,000 acres (Haslam & Schroer, 2012). According to TDOT’s traffic history data set, there are sections of I-840 that receive less than 10,000 vehicles per day,
and the busiest sections of the road experience less than 45,000 vehicles a day (TDOT Applications, 2016).

A convenience sample was derived from a public listing of Tennessee Agriculture Enhancement Program (TAEP) recipients. Because the TAEP program is publically funded, the contact information of farmers receiving cost-share is public information. A list of all TAEP recipients from 2013-2015 was obtained using public records. The list provided a reliable bank of producers in the I-840 area. Five hundred twenty-nine livestock producers whose residency was listed in the aforementioned counties were selected and contacted based on Dillman, Smith, and Christian’s (2014) tailored design method. Five contacts were used and the protocols varied based on the mode of contact (electronic or mail). TAEP recipients with email addresses were contacted electronically four times using the Qualtrics survey software. Non-respondents of the electronic survey were also contacted by mail. Mail respondents were sent a prenotice, the survey, and three reminders with additional surveys.

The livestock producers in this study agreed to participate by signing an electronic or paper informed consent approved by the University of Tennessee’s Institutional Review Board. The survey took approximately 15 to 20 minutes to complete. Of the 529 TAEP recipients initially contacted, five members of the sample were recorded through correspondences as being deceased, which reduced the sampling frame to 524. Completed surveys were returned by 279 livestock producers or 53.2% of the sampling frame. Nonresponse was not addressed due to the sampling frame being a convenience frame. Therefore, readers should use caution when generalizing the results unless data confirms the sample of this study is representative of other populations of livestock producers.

Participants included 242 males and 31 females (six did not provide this data). The average age was 57.7 years old, and 96.4% described their ethnicity as white, 1.4% as black or African-American, 0.4% as Native American or American Indian, and 1.8% did not prefer to answer. One hundred of 277 who described their farming employment status indicated they were full-time farmers, and 272 provided their highest level of education: 2.2% some high school, 23.9% high school, 9.2% trade or technical or vocational training, 19.5% some college, 27.2% bachelor’s degree, 10.7% master’s degree, and 7.4% PhD. A majority were 15 miles or less from an I-840 access point with 0 – 5 miles, 5.1 – 10 miles, 10.1 – 15 miles, 15.1 – 20 miles, and 20.1 or more miles being 19.8%, 24.1%, 18.7%, 14.7%, and 22.7%, respectively.

The questionnaire utilized for data collection was the Right-of-Way Innovation Questionnaire and was developed by the researchers using guidelines proposed by the tailored design method (Dillman et al., 2014). The questionnaire consisted of 12 demographic items, an 8 item Agricultural Modernization scale, 27 items to assess hay use and current practices, 5 items to assess knowledge of Tennessee Statute 54-5-134, a 7 item Attitudes Toward Right-of-Way Hay Harvesting scale, 1 open-ended and 17 close-ended items to assess barriers of right-of-way hay harvesting and 10 items related to the economics of hay harvesting.

The Agricultural Modernization scale was adapted from Knight, Weir, and Woldehanna’s (2003) Attitudes Toward Modernization scale. Because Knight et al.’s scale focused on crop production as opposed to overall general agriculture and to update item wording to a present day translation, slight wording changes were made to five of the eight items. For example, I like to try new crops was changed to I like to try new things in agriculture and The way my father farmed is still the best way was changed to The way the previous generation farmed is still the best way.
Furthermore, the *Attitudes Toward Right-of-Way Hay Harvesting* scale was developed by modifying the *Agricultural Modernization* scale. One item was eliminated from the *Agricultural Modernization* scale because of the specificity of the scale to right-of-way hay harvesting. The remaining 7 items were modified to include right-of-way hay harvesting in each item. For example, *I want to try new farming techniques* was changed to *I am interested in trying right-of-way hay harvesting and I want to see new techniques tried first by others* was changed to *I want to see right-of-way hay harvest tried first by others*. The *Agricultural Modernization* and *Attitudes Toward Right-of-Way Hay Harvesting* scales used the following 5-point rating scale: 1 = strongly disagree, 2 = disagree, 3 = neither agree nor disagree, 4 = agree, 5 = strongly agree. Also, based on precedence set by previous researchers (Enochs, Smith, & Huinker, 2000; Haynes & Stripling, 2014), livestock producers’ *Agricultural Modernization* and *Attitudes Toward Right-of-Way Hay Harvesting* scores were categorized as low (1.00 to 2.33), moderate (2.34 to 3.67), and high innovation (3.68 to 5).

The 27 hay use and current practices items were adapted from Penton Research’s (2015) beef forage study, and the barrier items were developed using the current literature. The questionnaire also contained a knowledge prompt regarding the Tennessee Statute 54-5-134, which was developed by the researchers. In 17 close-ended questions, producers were surveyed regarding their perceptions of possible barriers to participating in right-of-way hay harvesting. Producers were asked to describe their perceptions towards the list of possible barriers according to a 5-point scale (1 = strongly disagree, 2 = disagree, 3= neither agree nor disagree, 4 = agree, 5 = strongly agree).

As suggested by Dillman et al. (2014), a preliminary questionnaire review was conducted by an expert panel consisting of an assistant professor of agricultural and resource economics, a TDOT lawyer, and an assistant professor of agricultural leadership, education and communications. The expert panel reviewed the questionnaire for face validity, wording, and structure. Cognitive interviews were also conducted with five TAEP recipients from counties not included in this study. Dillman et al. (2014) recommends conducting cognitive interviews to ensure that “respondents comprehend questions as intended by the survey sponsor and whether questions can be answered accurately” (p. 244). Information from the interviews led to the following revisions: (a) rewording two items to improve clarity, (b) a gray background was added to the skip logic wording, and the words were bolded to make the skip logic more apparent on the paper survey, and (c) the informed consent agreement or disagreement statements were bolded and underlined on the paper survey to make them more apparent.

After making these revisions, a sample of 38 TAEP recipients from Maury County was selected to take part in a pilot test. For the pilot test, one modification was made to the questionnaire. A suggestion/comment item was placed at the end of the survey to elicit questionnaire feedback. Based on the feedback, one spelling error was corrected. Internal-consistency was assessed for the two scales using Cronbach’s alpha. The pilot test reliabilities for the *Agricultural Modernization* and *Attitudes Toward Right-of-Way Hay Harvesting* scales were found to be .70 and .81 respectively.

Descriptive statistics were used to summarize demographics, hay use and current practices, knowledge of Tennessee Statute 54-5-134, barriers of right-of-way hay harvesting, and economics of hay harvesting. A summated mean was calculated for the *Agricultural Modernization* scale after reverse coding items 1, 3, 5, and 7. Additionally, a summated mean was calculated for the *Attitudes Toward Right-of-Way Hay Harvesting* scale after reverse coding items 1, 3, 5, and 6. Paired t-tests were utilized to determine if significant differences existed among *Agricultural Modernization* and *Attitudes Toward Right-of-Way Hay Harvesting* scores in addition to the amount livestock...
producers are willing to spend to harvest right-of-way hay versus the amount they are willing to pay someone to harvest right-of-way hay. Effect sizes were calculated for statistically significant results using Dunlap, Cortina, Vaslow, and Burke’s (1996) formula for Cohen’s $d$ to correct for overestimation due to the correlation between measures. Finally, a stepwise regression was used to determine factors impacting willingness to harvest right-of-way hay as measured by the Attitudes Toward Right-of-Way Hay Harvesting scale.

Results

Current Awareness, Need, and Utilization of Tennessee Statute 54-5-134

In an inventory analysis of livestock owned by the livestock producers, beef cattle accounted for 86.4% of all animals, with 19,647 head, and dairy cattle were 844 head or 3.7% of all livestock. Goats and sheep were 788 and 770 head respectively, which is 3.5% and 3.4% of the inventory. Equine accounted for 1.6% with 362 head, and 318 head of other livestock were reported, which was 1.4% of the inventory.

As shown in Table 1, 18 or 7.2% of the livestock producers were aware of the statute providing the right to harvest hay from Tennessee right-of-ways prior to the questionnaire. Four of those 18 livestock producers indicated they learned of Tennessee Statute 54-5-134 from the University of Tennessee Extension service. None of the livestock producers who participated in this study had applied, received, or utilized a permit to harvest right-of-way hay.

Table 1

Livestock Producers’ Awareness of Tennessee Statute 54-5-134

<table>
<thead>
<tr>
<th>Item</th>
<th>$f$</th>
<th>%</th>
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<tbody>
<tr>
<td>Aware of Tennessee Statute 54-5-134?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>18</td>
<td>7.2</td>
</tr>
<tr>
<td>No</td>
<td>233</td>
<td>92.8</td>
</tr>
<tr>
<td>Learned from University of Tennessee Extension?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>4</td>
<td>25.0</td>
</tr>
<tr>
<td>No</td>
<td>12</td>
<td>75.0</td>
</tr>
<tr>
<td>Applied for permit?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>No</td>
<td>16</td>
<td>100.0</td>
</tr>
</tbody>
</table>

As shown in Table 2, 99.2% of the livestock producers utilized hay for feed, and 67.7% of the livestock producers who harvested hay in 2015 experienced a surplus. In 2015, the livestock producers harvested 76.5% of the total hay utilized (see Table 3). These hay resources were primarily harvested from owned land, leased land, and non-leased land with owner’s permission. Furthermore, the livestock producers reported fescue (42.2%) and mixed grass (47.6%) as their top two types of hay harvested. The remaining 23.5% of hay utilized was purchased.
Table 2

*Livestock Producers’ Hay Use and Supply in 2015*

<table>
<thead>
<tr>
<th>Items</th>
<th>( f )</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do you use hay to feed livestock?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>250</td>
<td>99.2</td>
</tr>
<tr>
<td>No</td>
<td>2</td>
<td>0.8</td>
</tr>
<tr>
<td>If you harvested hay in 2015, did you harvest a surplus of hay?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>149</td>
<td>67.7</td>
</tr>
<tr>
<td>No</td>
<td>71</td>
<td>32.3</td>
</tr>
</tbody>
</table>

Table 3

*Livestock Producers’ 2015 Hay Harvesting Methods and Forage Species*

<table>
<thead>
<tr>
<th>Items</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Method of hay harvest</td>
<td></td>
</tr>
<tr>
<td>I cut hay off my own land</td>
<td>42.4</td>
</tr>
<tr>
<td>I cut hay off of leased land</td>
<td>20.6</td>
</tr>
<tr>
<td>I pay someone to cut hay off my own land</td>
<td>6.0</td>
</tr>
<tr>
<td>I pay someone to cut hay off of leased land</td>
<td>2.8</td>
</tr>
<tr>
<td>I purchase my hay</td>
<td>23.5</td>
</tr>
<tr>
<td>I cut hay off non-leased land with owner permission.</td>
<td>14.2</td>
</tr>
<tr>
<td>Other</td>
<td>0.2</td>
</tr>
<tr>
<td>Species of hay utilized</td>
<td></td>
</tr>
<tr>
<td>Fescue</td>
<td>42.2</td>
</tr>
<tr>
<td>Alfalfa</td>
<td>1.8</td>
</tr>
<tr>
<td>Alfalfa mix</td>
<td>0.3</td>
</tr>
<tr>
<td>Bermuda</td>
<td>2.7</td>
</tr>
<tr>
<td>Bermuda mix</td>
<td>1.6</td>
</tr>
<tr>
<td>Grass mix</td>
<td>47.6</td>
</tr>
<tr>
<td>Other</td>
<td>6.9</td>
</tr>
</tbody>
</table>
Perceptions of Barriers to Participating in Right-of-Way Hay Harvesting

As displayed in Table 4, the majority of livestock producers indicated barriers to participating in right-of-way hay harvest including: (a) low quality hay, (b) roadside debris and litter, (c) contaminated with chemicals and metals, (d) hay transport, (e) the need for insurance and performance bond, (f) meeting deadlines set by governmental officials, (g) meeting deadlines set by current right-of-way contractors, (h) communicating with current right-of-way contractors, (i) having to plan around contracted litter removals, (j) slopes, (k) traffic and (1) narrow shoulders and medians on I-840. The highest ranked items, roadside debris and litter and traffic, received 85.1% and 80.0% agreeance, respectively. Of the remaining items, mixed species hay and cannot legally sell hay were the least concerning barriers to livestock producers with 28.4% and 28.0% disagreement respectively.

Table 4

Livestock Producers’ Perceptions of Possible Barriers to Utilization of Their Rights According to Tennessee Statute 54-5-134

<table>
<thead>
<tr>
<th>Items</th>
<th>Disagree</th>
<th>Neither agree nor disagree</th>
<th>Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>f</td>
<td>%</td>
<td>f</td>
</tr>
<tr>
<td>Roadside debris and litter</td>
<td>13</td>
<td>5.4</td>
<td>23</td>
</tr>
<tr>
<td>Traffic</td>
<td>14</td>
<td>5.7</td>
<td>35</td>
</tr>
<tr>
<td>Slopes</td>
<td>15</td>
<td>6.1</td>
<td>45</td>
</tr>
<tr>
<td>Contaminated with chemicals and metals</td>
<td>19</td>
<td>7.8</td>
<td>57</td>
</tr>
<tr>
<td>Narrow shoulders and medians on I-840</td>
<td>18</td>
<td>7.3</td>
<td>61</td>
</tr>
<tr>
<td>Hay transport</td>
<td>33</td>
<td>13.5</td>
<td>52</td>
</tr>
<tr>
<td>Meeting deadlines set by government officials</td>
<td>22</td>
<td>8.9</td>
<td>64</td>
</tr>
<tr>
<td>Meeting deadlines set by current right-of-way contactors</td>
<td>22</td>
<td>8.9</td>
<td>70</td>
</tr>
<tr>
<td>Having to plan around contracted litter removals</td>
<td>25</td>
<td>10.0</td>
<td>67</td>
</tr>
<tr>
<td>Low quality hay</td>
<td>32</td>
<td>13.1</td>
<td>67</td>
</tr>
<tr>
<td>The need for insurance and performance bond</td>
<td>43</td>
<td>17.6</td>
<td>63</td>
</tr>
<tr>
<td>Communicating with current right-of-way contactors</td>
<td>28</td>
<td>11.5</td>
<td>89</td>
</tr>
<tr>
<td>Communicating with government officials</td>
<td>37</td>
<td>15.1</td>
<td>91</td>
</tr>
<tr>
<td>Strict rules</td>
<td>42</td>
<td>17.2</td>
<td>109</td>
</tr>
<tr>
<td>Mixed species hay</td>
<td>67</td>
<td>28.4</td>
<td>99</td>
</tr>
<tr>
<td>Optional hay testing fees</td>
<td>53</td>
<td>21.6</td>
<td>120</td>
</tr>
<tr>
<td>Cannot legally sell hay</td>
<td>68</td>
<td>28.0</td>
<td>114</td>
</tr>
</tbody>
</table>
Attitudes Toward Agricultural Modernization and Right-of-Way Hay Harvesting

The summated mean of the *Agricultural Modernization* scale was 3.71 ($SD = 0.42$), which corresponds to high innovation. Examining attitudes toward agricultural innovation further revealed 51.5% of the livestock producers possessed high innovative attitudes toward agriculture, and 48.5% possessed moderate innovation attitudes toward agriculture. None of the livestock producers possessed low innovation attitudes toward agriculture (See Table 5).

The summated mean for the *Attitudes Toward Right-of-Way Hay Harvesting* scale was 2.99 ($SD = 0.63$), which corresponds to moderate innovation. As shown in Table 6, 12.4% of the livestock producers held a high innovation attitude, 75.9% held a moderate innovation attitude, and 11.7% held a low innovation attitude toward right-of-way hay harvesting.

Table 5

<table>
<thead>
<tr>
<th>Livestock Producers’ Agriculture and Right-of-Way Innovation Classifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scale</td>
</tr>
<tr>
<td>-------</td>
</tr>
<tr>
<td>Attitudes toward agricultural modernization</td>
</tr>
<tr>
<td>Attitudes toward right-of-way hay harvesting</td>
</tr>
</tbody>
</table>

Note. 1.00 to 2.33 = low innovation, 2.34 to 3.67 = moderate innovation, 3.68 to 5 = high innovation.

Furthermore, the *Agricultural Modernization* summated mean was 0.73 ($SD = .64$) greater than the *Attitudes Toward Right-of-Way Hay Harvesting* summated mean, and the difference was statistically significant ($p < .05$; Table 6). The practical significance of the difference was assessed using Cohen’s $d$, and the effect size was 1.35, which is a large effect size (Kotrlik, Williams, & Jabor, 2011). Thus, livestock producers were substantially more innovative in general agricultural practices as compared to right-of-way hay harvesting.

Table 6

<table>
<thead>
<tr>
<th>Change in Perceived Innovativeness According to Livestock Producers’ Agriculture and Right-of-Way Innovation Classifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean difference</td>
</tr>
<tr>
<td>Innovativeness posttest - pretest</td>
</tr>
</tbody>
</table>
Produced and Contracted Harvesting of Right-of-Way Hay

Two hundred eleven (88.7%) livestock producers indicated they were not interested in paying to cut right-of-way hay (see Table 7). The remaining 11.3% indicated they would pay to harvest right-of-way hay. Also, 7.9% of the livestock producers were willing to pay $1-10/acre, and 3.3% were willing to pay more than $10/acre to harvest right-of-way hay.

Table 7

*Amount Producers Are Willing to Pay to Harvest One Acre of Right-of-Way Hay*

<table>
<thead>
<tr>
<th>Response</th>
<th>( f )</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nothing</td>
<td>211</td>
<td>88.7</td>
</tr>
<tr>
<td>$1-5</td>
<td>12</td>
<td>5.0</td>
</tr>
<tr>
<td>$6-10</td>
<td>7</td>
<td>2.9</td>
</tr>
<tr>
<td>$11-15</td>
<td>2</td>
<td>0.8</td>
</tr>
<tr>
<td>$16-20</td>
<td>3</td>
<td>1.3</td>
</tr>
<tr>
<td>$21-25</td>
<td>1</td>
<td>0.4</td>
</tr>
<tr>
<td>$26-30</td>
<td>1</td>
<td>0.4</td>
</tr>
<tr>
<td>$31 or more</td>
<td>1</td>
<td>0.4</td>
</tr>
</tbody>
</table>

Additionally, 169 (74.1%) livestock producers indicated they were not interested in paying someone else to cut right-of-way hay for their own use (see Table 8). The remaining 25.9% indicated they would pay someone else to harvest right-of-way hay. Also, 17.5% of the livestock producers were willing to pay someone more than $10/acre to harvest right-of-way hay.

Table 8

*Amount Producers Are Willing to Pay Someone to Harvest One Acre of Right-of-Way Hay*

<table>
<thead>
<tr>
<th>Response</th>
<th>( f )</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nothing</td>
<td>169</td>
<td>74.1</td>
</tr>
<tr>
<td>$1-5</td>
<td>11</td>
<td>4.8</td>
</tr>
<tr>
<td>$6-10</td>
<td>8</td>
<td>3.5</td>
</tr>
<tr>
<td>$11-15</td>
<td>10</td>
<td>4.4</td>
</tr>
<tr>
<td>$16-20</td>
<td>11</td>
<td>4.8</td>
</tr>
<tr>
<td>$21-25</td>
<td>6</td>
<td>2.6</td>
</tr>
<tr>
<td>$26-30</td>
<td>7</td>
<td>3.1</td>
</tr>
<tr>
<td>$31 or more</td>
<td>6</td>
<td>2.6</td>
</tr>
</tbody>
</table>
As shown in Table 9, a significant difference was not found in regard to the amount livestock producers are willing to pay versus the amount they are willing to pay someone to harvest right-of-way hay. To that end, the mean difference was $6.00/acre ($SD = 13.39, p > .05).

Table 9

<table>
<thead>
<tr>
<th>Mean difference</th>
<th>SD</th>
<th>SE</th>
<th>T</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Price willing to spend to harvest right-of-way – Price willing to pay someone to harvest right of way hay</td>
<td>-$6.00/acre</td>
<td>13.39</td>
<td>3.46</td>
<td>-1.74</td>
</tr>
</tbody>
</table>

Factors Impacting Willingness to Harvest Right-of-Way Hay

Stepwise multiple regression was used to determine factors impacting willingness to harvest right-of-way hay as measured by the *Attitudes Toward Right-of-Way Hay Harvesting* scale. Four variables, shown in Table 10, explained 29.6% of the variance in harvest attitude. Livestock producers willing to cut hay off of right-of-ways if they could sell it, had a mean score 0.47 points higher than the mean of those respondents who were not interested in cutting hay off of right-of-ways. Using an alfalfa mix hay resulted in a decline in the mean score of 1.27 points. A producer’s score increased 0.06 points per $5/acre increment for those willing to pay someone else to cut right-of-way for hay. Finally, producers who purchased their hay showed a 0.24 increase in their summated mean of the *Attitudes Toward Right-of-Way Hay Harvesting* scale.

Table 10

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>SE</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Willingness to cut hay off right-of-way if it can be sold</td>
<td>0.47</td>
<td>0.10</td>
<td>.000</td>
</tr>
<tr>
<td>Alfalfa mix hay users</td>
<td>-1.27</td>
<td>0.45</td>
<td>.006</td>
</tr>
<tr>
<td>Willingness to pay someone else to cut hay off right-of-way</td>
<td>0.06</td>
<td>0.02</td>
<td>.017</td>
</tr>
<tr>
<td>Producers that purchase their hay</td>
<td>0.24</td>
<td>0.11</td>
<td>.032</td>
</tr>
</tbody>
</table>

Note. Full Model: $R^2 = 0.319$; **Adjusted** $R^2 = 0.296$

Discussions and Recommendations

Most livestock producers did not have prior knowledge of their right to harvest right-of-way hay. According to Rogers (2003), knowledge is the first step in adopting an innovation. Without knowledge, an attitude towards an innovation cannot be made (Rogers, 2003). Because producers were learning of the innovation via this study, they had little time to process the law and
develop more than an initial attitude. Sahin (2006) concluded from a review of innovation in educational technology that “uncertainty about the innovation’s functioning… affect[s] the individual’s opinions and beliefs about the innovation” (p. 16). Because producers lacked the ability to process the law in terms of the outlined steps of the persuasion stage, (a) relative advantage, (b) compatibility, (c) complexity, (d) trialability, and (e) observability, development of an attitude was shallow (Rogers, 2003), and as a result, impacted this study.

The need for hay is evident according to data collected from livestock producers. Despite having normal rainfall through the 2015 hay harvesting months, except for a window from May 12th–26th in which rainfall was abnormally dry (National Drought Mitigation Center, 2015), 32.3% who harvested their hay, as opposed to purchasing it, did not have a surplus. The term selective perception, which is “the tendency to interpret communication messages in terms of the individual’s existing attitudes and beliefs” (Rogers, 2003, p. 171), described the importance of need in the innovation-decision process. Thus, the producers that did not obtain a surplus of hay in 2015 may be more apt to pursue information concerning the innovation (Rogers, 2003).

Also, hay surpluses are vital to stable agricultural economics due to the impact from unforeseen drought, and hay storage is an option for reducing the effects of drought (Coppock, 2011). In the 2010-2011 TAEP year, 37.9% of the $14,184,693 budget was utilized on hay storage facilities for producers, so there is capacity for hay store among this population of producers. While 2015 was a good rain year, a drought may change attitudes and encourage higher acceptance of right-of-way haying and storage. Coppock (2011) found cattle ranchers in Utah changed practice and preparedness after drought.

Furthermore, data showed the hay utilized by our sample in 2015 was 89.8% fescue or grass mix. This is interesting given livestock producers in the Austin, Texas area, where similar laws exist pertaining to the right to right-of-way hay harvest (W. Rehnborg, Texas Department of Transportation, personal communication, October 19, 2015), do not participate in right-of-way hay harvesting because they are wary of the mixture of species of grasses growing on right-of-ways. According to Bates (1999), the majority of grass in Tennessee is tall fescue or tall fescue mixed with orchard grass or timothy. Livestock producers’ current practice of cutting hay and feeding mixed grass hay may be conducive to right-of-way hay harvest adoption.

In 2015, of the hay acquired by livestock producers, 37.6% was derived from land they did not own – (a) I cut hay off of leased land, (b) I pay someone to cut hay off of leased land, and (c) I cut hay off non-leased land with owner permission. Because the right-of-way harvest permits are structured similarly to leased land (TDOT, 2003), the common utilization of leased land and non-leased land agreements are important to consider. If farmers are already utilizing leased or borrowed land as an agricultural practice (Rogers, 2003), they may be more likely to adopt right-of-way hay harvesting once they are made aware of Tennessee Statute 54-5-134.

None of the livestock producers in this study had ever utilized their right to harvest hay from state right-of-ways. This finding is consistent with the researchers’ conversation with L. South (personal communication, October 13, 2015) of TDOT who had only one remembrance of anyone applying for a permit in his region. While rejection of the right-of-way hay harvesting innovation is one plausible explanation as to why livestock producers do not apply for right-of-way hay harvesting permits, Rogers’ (2003) diffusion of innovation theory suggests the absence of knowledge of Tennessee Statute 54-5-134 as another plausible explanation.

In regard to barriers to participating in right-of-way hay harvesting, the item roadside debris and litter earned the highest rank among all perceived barriers. TDOT also has concerns
regarding roadway litter. According to TDOT (2016), “excessive litter can become a road hazard and litter can present a danger when mowing right-of-way” (p.12). In 2015, the state of Tennessee appropriated $316,800 for litter cleanup in the five counties represented in this study (TDOT, 2016). As a result of Tennessee’s initiatives to clean up their roadways through cleanup and educational efforts, there have been consistent declines in the amount of litter on roadways (TDOT, 2016). By working to eliminate right-of-way litter, there is the potential to eliminate or greatly reduce the litter barrier for livestock producers. Furthermore, TDOT officials and livestock producers may be able to work together to align litter removal with hay harvesting to ensure that less litter ends up in right-of-way harvested hay.

Livestock producers in this study also indicated low quality hay was a potential barrier. This was a predicted deterrent by W. Rehnborg (personal communication, October 13, 2015) and Cherney et al. (1990). However, Cherney et al. found the lowest quality hay harvested from right-of-ways in their study was sufficient for mature beef cattle in accordance with standards set by the National Research Council (1984). Beef cattle were the most prevalent species of livestock owned by Tennessee livestock producers in this study. Because beef cattle operations are so commonplace in the region surveyed, hay quality may be high enough for these operations.

One of the least deterring items to adoption of right-of-way hay harvesting was mixed species hay. This finding stands in opposition to W. Rehnborg (personal communication, October 13, 2015) and Cherney et al. (1990) who professed livestock producers would not be accepting of hay that contained several varieties of grasses. As previously stated, when considering current agricultural practices by livestock producers in Tennessee, producers are already utilizing mixed species hay, and this practice may aid in the diffusion of right-of-way hay.

Overall, livestock producers possessed high innovation in agricultural practices. Therefore, livestock producers in this study appear to be willing to adopt new agricultural practices and technology. According to Rogers (2003), innovativeness is a prior condition required of a potential adopter of an innovation (Rogers, 2003). Innovation is vital to agriculture in the upcoming decades as the adoption of new techniques and practice have been called upon to meet new satiety demands of a growing population (Kiers et al., 2008).

When attitudes were collected post-knowledge prompt concerning the specific right-of-way hay harvest innovation, livestock producers possessed moderate attitudes of the innovation. Attitude can influence the risk factors associated with an innovation in farmers (Botterill & Mazur, 2004). Botterill and Mazur (2004) found farmers’ risk perceptions are often over-exaggerated and may be caused by having a nature of being risk averse, which can be partially attributed to a lack of knowledge (Botterill & Mazur, 2004). Since the livestock producers were unaware of their right to harvest right-of-way hay prior to this study and sometimes exaggerate risk, this may explain why attitudes towards right-of-way hay were moderate and not consistent with attitude toward general agricultural practices.

In addition, a significant difference existed between the livestock producers’ attitude toward agricultural innovation and the specific innovation of right-of-way hay harvesting. Innovativeness of the livestock producers fell significantly from high to moderate when questioned specifically in regards to the right-of-way hay innovation. Therefore, at the time of this study, livestock producers held a more negative attitude towards the right-of-way hay harvest innovation. Rogers (2003) stated that it is assumed that attitude will lead to action, but typically in practice, a discrepancy exists between attitude and practice. In addition, circumstance may play a large factor in moving to action (Rogers, 2003). For instance, a producer may have a moderate attitude during rainy years, but drought in the future may force them to reconsider attitudes they have developed.
With that in mind, there are many factors that lead to adoption of an innovation (Rogers, 2003), thus, current hay growing conditions, lack of knowledge, and the aforementioned barriers may partially account for the difference in attitude.

In regard to paying someone else to cut and harvest hay off state right-of-ways, over a quarter of producers indicated they would be willing to do so, and 17.5% would be willing to pay over $10 an acre. This may indicate hay quality and yield are not factors discouraging these producers from adopting the practice of using right-of-way hay. Nothing in the most recent version of rules for Tennessee Statute 54-5-134 specifies that the permit holder has to be the one to physically collect hay (TDOT, 2003). If producers are willing to permit the land and contract the work, then there may be viability in pursuing the dissemination of information about the law. Also, producers may be willing to purchase right-of-way hay from the state or state contractors.

Statistically, there was no difference found between the amount a livestock producer was willing to pay to harvest hay on state right-of-ways, and the amount a producer would pay to have someone else harvest the hay for them. This may indicate that the value of right-of-way hay is found in having access to right-of-way hay and is not necessarily influenced by the method of harvesting the hay. Because the mean difference of $6/acre was not significant, one can conclude the amount livestock producers were willing to pay for right-of-way hay did not differ in terms of who was harvesting the hay.

Lastly, four variables were identified that accounted for 29.6% of the variance in Attitudes Toward Right-of-Way Hay Harvesting scores. Attributes leading to a more positive attitude toward right-of-way hay harvest were: (a) the ability to sell hay harvested from right-of-ways, (b) willing to pay someone else to cut hay off right-of-ways, and (c) currently purchasing hay. Alternatively, an attribute leading to a more negative attitude was currently feeding alfalfa mix hay. Investigating the effect of changing Tennessee law to allow the sale of right-of-way hay and allowing livestock producers to pay someone else to harvest the right-of-way hay may be of interest, since the opportunity to sell and willingness to pay someone else to harvest the hay resulted in more favorable attitudes toward right-of-way harvesting. Furthermore, livestock producers who buy their hay supply may see Tennessee Statute 54-5-134 as a way to reduce their hay cost. On the other hand, livestock producers feeding alfalfa mix hay may possess less favorable attitudes due to alfalfa mix hay being a higher quality forage than other grass mixes, which are generally found in Tennessee grasslands (Bates, 1999). The effects the factors above had on attitude supports Rogers (2003). Rogers stated previous practice related to an introduced innovation influences adoption. In this case, if livestock producers were allowed to purchase, sell, or pay someone else to harvest right-of-way, they may be more likely to harvest or support right-of-way hay harvesting and less likely to do so if they feed alfalfa mix or higher quality hay.

**Recommendations for Future Research**

Based on our findings, the following recommendations for future research are made:

1. Due to the limited scope of this study, replication should be done statewide to accumulate more data on economic conditions and livestock producers’ current awareness, attitudes, and barriers in relation to right-of-way hay harvesting.
2. Future research should further explore factors that impact adoption of right-of-way hay.
3. Since most producers were not aware of Tennessee Statute 54-5-134, future research is warranted on the effects of educational programming and promotion of the law. Would attitudes toward right-of-way hay harvesting differ after educational programming or promotion? Most producers in this study became aware of Tennessee Statute 54-5-134 by...
participating in the study and had only minutes to develop attitudes toward harvesting right-of-way hay. Will increased awareness result in more permits issued?

4. Future research should investigate the actual risk and impact of perceived barriers to right-of-way hay harvesting.

5. Because there was interest among livestock producers to sell right-of-way hay, as well as livestock producers interested in buying right-of-way hay, future research should investigate the feasibility of accommodating these interests.

6. Future research should determine if livestock producers are willing to purchase right-of-way hay from the state of Tennessee or state contractors.

7. Research is warranted to determine the nutritional quality of right-of-way hay.

**Recommendations for Practice**

Based on our findings, the following recommendations are made:

1. Livestock producers should be made aware of Tennessee Statute 54-5-134. Extension professionals in Tennessee can serve as a source of information, and Extension communication channels can be used to share information regarding Tennessee Statute 54-5-134. For example, livestock producers can be made aware of Tennessee Statute 54-5-134 during master beef and goat programming, and Tennessee Statute 54-5-134 can be discussed in Extension bulletins/fact sheets. Furthermore, the University of Tennessee and Tennessee State University Extension, private industry representatives, and other agricultural educators should utilize this study to develop educational programs in conjunction with TDOT officials to further educate livestock producers across the state of their rights.

2. Livestock producers that exhibit the factors determined to produce more favorable attitudes toward right-of-way hay harvesting should be targeted with information related to Tennessee Statute 54-5-134.

3. Perceived barriers may become lessened with education. Future practice should focus on educating interested livestock producers on how to minimize barriers related to right-of-way hay harvesting.

4. The state of Tennessee should continue efforts to reduce litter on right-of-ways; reduced litter may encourage livestock producers to obtain permits.

5. Because there was interest among livestock producers to sell right-of-way hay, as well as livestock producers interested in purchasing right-of-way hay, the state of Tennessee should explore allowing permit holders to sell hay to livestock producers.

**References**


Conversing about Citrus Greening: Extension’s Role in Educating about Genetic Modification Science as a Solution

Taylor K. Ruth¹, Alexa J. Lamm², Joy N. Rumble³ & Jason D. Ellis⁴

Abstract

Extension agents across the nation will need to facilitate difficult conversations with the public if genetic modification (GM) science is used to combat citrus greening disease. This study used the innovation characteristics described by Rogers to explore if using GM science as a solution to citrus greening had diffused amongst US residents. An online survey was completed by 1,051 respondents across the US. Respondents were then classified into geographic regions. Demographic differences amongst respondents from the regions were identified; however, respondents from all regions had neutral perceptions of GM science’s compatibility, trialability, complexity, and observability. All regions aside from the West agreed there was a relative advantage to using GM science; the West neither agreed nor disagreed. The Midwest was the only region with half of respondents agreeing they would consume GM citrus. All diffusion characteristics aside from observability were predictors of GM citrus consumption, and when accounting for diffusion characteristics, the Midwest was less likely to consume GM products when compared to the Northeast. Recommendations are offered for how extension agents can develop educational programming tailored to the needs of their regions to aid consumers in making educated decisions about GM citrus in the future.

Keywords: diffusion of innovations, extension, citrus, citrus greening

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Introduction

Extension agents are often referred to as “change agents” and help communities adapt to a variety of issues (Peek et al., 2015). Extension is not only tasked with educating the public (Benge, 2015).
Harder, & Carter, 2011) but engaging the public to help solve complex problems (Warner, Hinrichs, Schneyer, & Joyce, 1998). These problems are not always simple, and extension agents have been asked by university and public leaders to facilitate conversations with the public about contentious and controversial topics (Patton & Blaine, 2001; Welch & Braunworth, 2010).

One of the most complicated topics extension agents communicate about is conventional versus nonconventional agriculture (Martin, 2016) and includes discussions about genetically modified (GM) crops (U.S. Department of Agriculture [USDA], 2015). In the past, extension agents have felt unprepared to foster conversations with the public about GM science and have expressed concern about providing the public with balanced information (Brown, Kiernan, Smith, Hughes, 2003). A recent meta-analysis concluded that GM crops posed no harm to human health (National Academy of Sciences, 2016; Nicolia, Manzo, Veronesi, & Rosellini, 2014), yet consumers have historically expressed suspicion of the technology (Senauer, 2013) and have been unsure about its associated risks and benefits (Ruth & Rumble, 2016). President Obama signed a law in August of 2016 that mandated food containing GM ingredients be labeled (Popken, 2016), which will likely drive more conversations amongst the public on the topic. To complicate matters, people living in different areas may hold varying agricultural values and require tailored extension education programs (Martin, 2016).

GM science may be a topic of debate, but it may also be the only way to save the citrus industry as it battles citrus greening (Allen, 2016). This disease is destroying the US citrus industry with no current solution. Citrus greening, or Huanglongbing (HLB), is caused by a bacterium spread by a small insect called the Asian citrus psyllid (UF/IFAS Citrus Extension, 2016a). The disease affects the entire tree and causes the fruit to taste bitter (UF/IFAS Citrus Extension, 2016b). There is no cure for citrus greening and no management practices that would be affordable for farmers (Singerman & Useche, 2016). Production dropped by over 100 million boxes in Florida during the 2014 season, and farmers reported 80% of their trees have been infected with HLB (Singerman & Useche, 2016). This disease could be the end of the $9 billion citrus industry in Florida (Voosen, 2014). Researchers have already used genetic science to create trees resistant to citrus canker, another major citrus disease, and have been using similar strategies to test greening resistant trees as well (Allen, 2016). Scientists are optimistic that GM science will be used to create citrus greening resistant trees in the near future (Allen, 2016). Experts in the industry expect that GM citrus trees could be the solution to the problem but only if consumers are willing to purchase and drink GM orange juice (Voosen, 2014).

Citrus production is not limited to Florida alone, with California and Texas as the two other major citrus producing states in the US (USDA, 2016b). Citrus greening had reached all three citrus producing states by 2014 (Harrell, 2014). While the disease has the potential to devastate citrus producing communities, consumers across the US will be affected if a solution is not found. Orange juice prices are expected to rise due the disease (Perez, 2017), and consumption of orange juice is expected to increase as well (USDA-Foreign Agricultural Services [FAS], 2016). However, consumers also use citrus in desserts, entrées, mixed drinks, home goods, and beauty products (Florida Department of Citrus, 2017), which could make the impact of citrus greening on consumers widespread if they are not able to find or purchase citrus products (USDA-FAS, 2016).

Extension agents are not always properly engaged with the public concerning agricultural issues (Gay, Owens, Lamm, & Rumble, 2017). With GM science as a viable solution to the disease, extension agents will need to learn how to facilitate potentially difficult conversations between researchers, growers, and consumers. Extension agents’ concerns about balancing facts and values regarding GM science (Brown et al., 2002) will need to be addressed before proper educational programming can be developed.
Even though citrus is primarily grown in three states, orange juice is consumed across the nation. As a national problem, extension agents need to be able to recognize how different regions of the US view GM science as a solution to citrus greening. Differences in newspaper coverage of GM science have been identified between regional areas of the US (Crawley, 2007), which may be reflective of residents’ attitude toward the technology. Variations in political ideology across the nation could also lead to differing degrees of acceptance of GM science as well. In accordance with Priority 2 of the National Research Agenda (Roberts, Harder, & Brashears, 2016), the purpose of this study was to explore the diffusion of the idea of using GM science amongst US residents as a solution to citrus greening in different regions of the US.

Theoretical Framework

Diffusion of innovations theory provided the framework for this study. Rogers (2003) described an innovation as a type of idea or practice that a group or person would consider new. The adoption of the innovation is dependent upon its perceived relative advantage, compatibility, complexity, trialability, and observability. The relative advantage of the innovation only has to be perceived by the person/group as being better than an alternative and does not have to be concrete (Rogers, 2003). How well the innovation aligns with the adopters’ social norms and values is its compatibility. Complexity describes how easy or difficult it is to understand the innovation, and trialability is how easily it can be tested. The final characteristic, observability, describes how well potential adopters can view others using the innovation. Innovations high in relative advantage, compatibility, trialability, and observability but low in complexity will diffuse the quickest through a group (Rogers, 2003). Additionally, people who guide others’ behaviors through social interactions, or opinion leaders, influence the rate of adoption for an innovation. After an opinion leader shares his or her experience with the innovation, the diffusion typically spreads (Rogers, 2003).

Extension has explored the diffusion of GM science amongst farmers (Perterson, Cassman, & Cantrell, 2002), but there have been few studies examining the diffusion of GM science amongst consumers. Weick and Walchi (2002) used the theory to explore diffusion of GM science with the public. The researchers concluded the relative advantage of GM crops provided benefits to farmers, but consumers viewed GM crops as having health, ethical, and environmental disadvantages compared to non-GM crops (Weick & Walchi, 2002). However, GM science was found to align more with American values when compared to Europeans, which made the innovation moderate in compatibility. Distinction between traditional, selective breeding of crops and genetic engineering has increased the complexity of understanding GM crops for the consumer (Weick &Walchi, 2002). While there are plenty of opportunities for consumers to purchase and try GM food, many of the GM products on the market do not directly benefit consumers. Consumers may have eaten GM food and not realized it, which lowered the trialability. Similarly, consumers were unable to observe the benefits of others using GM food due the lack of direct benefits, which also lowered observability (Weick &Walchi, 2002).

Klerk and Sweeney (2007) researched the effect of knowledge on perceptions of risk and adoption of GM food. The researchers concluded that for perceptions of relative advantage to increase, consumers would have to possess more positive attitudes toward the innovations than they did at the time. Rumble et al. (2016) looked specifically at the diffusion of GM science to combat citrus greening amongst undergraduate students in a citrus growing state. Relative advantage was the only diffusion characteristic viewed positively by the students; however, compatibility was the only characteristic predictive of students’ likelihood of consuming GM citrus. Rumble et al. (2016) suggested research should be conducted on consumers nationwide to determine if the millennial
generation differs in their attitudes toward GM science and purchasing behavior when compared to the average consumer.

The research for this manuscript explored what US consumers believe about the diffusion of GM science, specifically examining perceptions of diffusion characteristics, and determined if differences exist in different regions of the US. The U.S. Census Bureau (2015) divided the country into four main regions: Northeast, South, Midwest, and West. The southern region includes Florida, Georgia, South Carolina, North Carolina, Virginia, West Virginia, Maryland, Delaware, Kentucky, Tennessee, Alabama, Mississippi, Arkansas, Louisiana, Oklahoma, and Texas. The southern region of the US has over one-third of the farms in the nation and is known for growing high yields of cotton and fruits (USDA, 2000). In 2012, 94% of cotton fields were GM (USDA, 2016a). Maine, New Hampshire, Vermont, Massachusetts, Connecticut, Rhode Island, New York, New Jersey, and Pennsylvania are all considered Northeastern states. This is the most populous region of the US, but accounts for 15% of US farms and 9% of the total cropland. Midwestern states have more cropland than any other area, the largest farms, and grow mostly cash grains (USDA, 2000), which include corn and soybeans. Eighty-five percent of corn acres and 75% of soybean acres in the US have been planted with GM crops (Fernandez-Cornejo, Wechsler, Livingston, & Mitchell, 2014). North Dakota, South Dakota, Nebraska, Kansas, Montana, Iowa, Missouri, Wisconsin, Illinois, Michigan, Indiana, and Ohio are all considered Midwestern states. Western region agriculture includes high production of fruits and more non-family farms than any other regions; however, this region has the least amount of cropland (USDA, 2000). Western states are Washington, Oregon, Idaho, Montana, Wyoming, Colorado, Utah, Arizona, New Mexico, Nevada, and California. The final US region is the Pacific region and includes Alaska and Hawaii. Alaska is not known for growing GM crops, but approximately 75% of the papaya in Hawaii were developed with GM science to stop the spread of a virus that was devastating the islands (Callis, 2013).

**Purpose and Objectives**

The purpose of this research was to explore the diffusion of GM science as a potential solution to citrus greening amongst different regions of the US so extension programs can be developed applicable to discussing GM science. The following research objectives guided this study:

RO1: Describe respondents in the Southern, Northeastern, Midwestern, and Western regions of the US.

RO2: Describe different regions’ perceptions of GM science’s diffusion characteristics.

RO3: Explore differences in regions’ perceptions of GM science’s diffusion characteristics.

RO4: Explore differences in regions’ likelihood to consume GM citrus products.

RO5: Determine how US region, relative advantage, compatibility, complexity, observability, and trialability predict likelihood to consume GM citrus products.

**Methodology**

An online survey instrument was used to collect the data for this study. The population of interest was US residents, 18 years and older. Qualtrics, an online public opinion research company, distributed the instrument to a non-probability sample of an opt-in panel. The survey was
distributed to 1,751 potential respondent in all 50 states in the US. To ensure responses were received from each state, quota sampling procedures were used at the beginning of the instrument. Additionally, two attention filters were used in the survey to ensure respondents were thoughtfully considering the questions. There were 1,051 respondents who met the quota requirements and passed the attention filters, which resulted in a 60% participation rate. Post-stratification weighting procedures were used to increase the generalizability of the research. The respondents’ demographics were weighted on sex, race, and age to reflect the 2010 National Census. Weighting procedures can lessen the effects of non-probability sampling, such as exclusion, non-participation, and selection bias, and provide representation sometimes better than probability sampling (Baker et al., 2015).

Although this research was part of a larger study, six constructs in addition to demographic questions were analyzed to fulfill the purpose. All questions were researcher-developed. Demographic questions included age, sex, income, education, race (check all that apply), ethnicity, and political affiliation.

Semantic differential and Likert-type scales were used to collect respondents’ perceptions of GM science’s diffusion characteristics. Relative advantage, compatibility, and trialability were measured with Likert-type scales that included 1 = strongly disagree, 2 = disagree, 3 = neither agree nor disagree, 4 = agree, and 5 = strongly agree. Relative advantage used eight items, which were averaged, to create the construct. Higher scores represented agreement that GM science offered a relative advantage. The items included statements like “GM science increases the amount of food a farmer can grow” and “GM science enhances the taste of food.”

Compatibility was measured with a six-item scale that asked respondents how GM science aligned with their personal values and beliefs. Negatively framed statements like “Overall, GM science does more harm than good” were reverse coded so that a five indicated respondents agreed GM science was compatible. The items were averaged to make the construct.

Trialability used five statements like “food products that result from plants made with GM science are easy to try” and “if given the opportunity, I would try food products that result from plants made with GM science.” Each statement was coded so that five indicated agreement that food made by GM science could be tried and one indicated disagreement. The construct was measured by averaging the five items. Real limits were created to aid in the interpretation of the results (Sheskin, 2004). Relative advantage, compatibility, and trialability used the following real limits: 1.00 – 1.49 = strongly disagree, 1.50 – 2.49 = disagree, 2.50 – 3.49 = neither agree nor disagree, 3.50 – 4.49 = agree, 4.50 – 5.00 = strongly agree.

Five-point, semantic differential scales measured respondents’ perceptions of complexity and observability. Negative adjectives, such as “complex” and “invisible,” were assigned a one and positive adjectives, like “simple” and visible” were assigned a five. The complexity construct included six pairs of adjectives and observability included six pairs too. Both constructs were created by averaging the items in each scale.

To determine if the idea of GM science had diffused amongst respondents, the final question asked their likelihood of consuming fruit or juice grown on a GM tree. A five-point Likert-type scale with the following labels was used to answer the question: 1 = extremely unlikely, 2 = unlikely, 3 = neither likely nor unlikely, 4 = likely and 5 = extremely likely. The question was recoded into a dichotomous vairable to use as the dependent variable in a logistic regression. Respondents were coded as likely to consume GM citrus products if they selected likley or
extremely likely to consume the fruit, and were coded as not likely to consume GM citrus products if they selected the alternatives.

A panel of experts reviewed the survey prior to distribution to account for the validity of the instrument. The panel included an associate professor with expertise in survey design, an assistant professor who specializes in food production and the Associate Director for the Center for Public Issues Education at the University of Florida (UF). After receiving IRB approval from UF, a pilot test confirmed that all constructs, except one, were reliable at an alpha level of at least 0.7 (Field, 2013). Initially, trialability had a Cronbach’s α of .67. After removal of one item in the construct, reliability increased to .76. In order to avoid a history effect, the survey was only open for two days (Ary, Jacobs, & Sorensen, 2010).

Regions of the US were created following the US census guide, with the Pacific region included with the Western region due to the small sample size. For objectives one and two, simple descriptive statistics were used to analyze the results. Objective three was fulfilled by using an ANOVA and a post hoc test. Because of unequal groups sizes in the regions, Tukey-HSD was used to determine individual differences between regions. Descriptive statistics and Chi-square analysis were used to explore objective four. Finally, a logistic regression was used to fulfill objective five. The regions were recoded as dummy variables, and the Northeast was treated as the control because it had the largest sample size (Field, 2013).

Results

Description of Respondents

The weighted demographics of the respondents can be seen in Table 1. The largest proportion of respondents in the South and Midwest were between the ages of 45 and 64. The largest age group in the Northeast and West was 25 to 44. The Northeast and Midwest were also the only regions where the majority of respondents were women. All four regions had similar education characteristics, but the Northeast had more respondents earning $150,000 or more annually compared to other regions. Nearly a quarter of respondents in the Northeastern and Western regions identified themselves as Hispanic. The West also had the highest proportion of respondents whose race was categorized as other and smallest proportion of white respondents. The largest political affiliations in the Midwest and West were independent, while almost half of the Northeast respondents and one-third of Southern respondents were democrats.
Table 1

Description of Respondents

<table>
<thead>
<tr>
<th>Age</th>
<th>South</th>
<th>Northeast</th>
<th>Midwest</th>
<th>West</th>
</tr>
</thead>
<tbody>
<tr>
<td>18-24</td>
<td>12%</td>
<td>11%</td>
<td>12%</td>
<td>10%</td>
</tr>
<tr>
<td>25-44</td>
<td>33%</td>
<td>43%</td>
<td>28%</td>
<td>41%</td>
</tr>
<tr>
<td>45-64</td>
<td>37%</td>
<td>29%</td>
<td>38%</td>
<td>34%</td>
</tr>
<tr>
<td>65+</td>
<td>18%</td>
<td>18%</td>
<td>23%</td>
<td>16%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Gender</th>
<th>South</th>
<th>Northeast</th>
<th>Midwest</th>
<th>West</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>49%</td>
<td>57%</td>
<td>51%</td>
<td>46%</td>
</tr>
<tr>
<td>Male</td>
<td>52%</td>
<td>43%</td>
<td>49%</td>
<td>54%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Education</th>
<th>South</th>
<th>Northeast</th>
<th>Midwest</th>
<th>West</th>
</tr>
</thead>
<tbody>
<tr>
<td>High School or less</td>
<td>17%</td>
<td>14%</td>
<td>14%</td>
<td>20%</td>
</tr>
<tr>
<td>Some College</td>
<td>30%</td>
<td>22%</td>
<td>30%</td>
<td>26%</td>
</tr>
<tr>
<td>2-year College Degree</td>
<td>14%</td>
<td>11%</td>
<td>8%</td>
<td>13%</td>
</tr>
<tr>
<td>4-year College Degree</td>
<td>27%</td>
<td>35%</td>
<td>32%</td>
<td>27%</td>
</tr>
<tr>
<td>Graduate or Professional School</td>
<td>12%</td>
<td>19%</td>
<td>16%</td>
<td>15%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Income</th>
<th>South</th>
<th>Northeast</th>
<th>Midwest</th>
<th>West</th>
</tr>
</thead>
<tbody>
<tr>
<td>$25,000 &gt;</td>
<td>16%</td>
<td>15%</td>
<td>23%</td>
<td>16%</td>
</tr>
<tr>
<td>$25,000 - $49,999</td>
<td>25%</td>
<td>18%</td>
<td>33%</td>
<td>28%</td>
</tr>
<tr>
<td>$50,000 - $74,999</td>
<td>22%</td>
<td>10%</td>
<td>19%</td>
<td>20%</td>
</tr>
<tr>
<td>$75,000 - $149,999</td>
<td>34%</td>
<td>35%</td>
<td>20%</td>
<td>32%</td>
</tr>
<tr>
<td>$150,000 or more</td>
<td>4%</td>
<td>14%</td>
<td>6%</td>
<td>4%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Race</th>
<th>South</th>
<th>Northeast</th>
<th>Midwest</th>
<th>West</th>
</tr>
</thead>
<tbody>
<tr>
<td>White</td>
<td>84%</td>
<td>80%</td>
<td>82%</td>
<td>69%</td>
</tr>
<tr>
<td>African American</td>
<td>14%</td>
<td>16%</td>
<td>11%</td>
<td>11%</td>
</tr>
<tr>
<td>Other</td>
<td>3%</td>
<td>6%</td>
<td>8%</td>
<td>24%</td>
</tr>
<tr>
<td>Hispanic</td>
<td>3%</td>
<td>24%</td>
<td>4%</td>
<td>26%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Political Affiliation</th>
<th>South</th>
<th>Northeast</th>
<th>Midwest</th>
<th>West</th>
</tr>
</thead>
<tbody>
<tr>
<td>Republican</td>
<td>30%</td>
<td>16%</td>
<td>16%</td>
<td>22%</td>
</tr>
<tr>
<td>Democrat</td>
<td>36%</td>
<td>50%</td>
<td>33%</td>
<td>36%</td>
</tr>
<tr>
<td>Independent</td>
<td>32%</td>
<td>31%</td>
<td>41%</td>
<td>37%</td>
</tr>
<tr>
<td>Other</td>
<td>2%</td>
<td>3%</td>
<td>2%</td>
<td>5%</td>
</tr>
</tbody>
</table>
Regional Perceptions of Diffusion Characteristics

The South, Northeast, and Midwest respondents agreed that GM science had a relative advantage, but the West neither agreed nor disagreed about the relative advantage (see Table 2). All four regions neither agreed nor disagreed about the compatibility or trialability of GM science. Additionally, all regions indicated that GM science was average in complexity and observability.

Table 2

Description of Regions’ Perceptions of GM Science Relative Advantage, Compatibility, Complexity, Observability, and Trialability

<table>
<thead>
<tr>
<th></th>
<th>South</th>
<th>Northeast</th>
<th>Midwest</th>
<th>West</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$n = 253$</td>
<td>$n = 317$</td>
<td>$n = 254$</td>
<td>$n = 227$</td>
</tr>
<tr>
<td>$M (SD)$</td>
<td>$M (SD)$</td>
<td>$M (SD)$</td>
<td>$M (SD)$</td>
<td>$M (SD)$</td>
</tr>
<tr>
<td>Relative Advantage</td>
<td>3.58 (0.76)</td>
<td>3.62 (0.69)</td>
<td>3.61 (0.71)</td>
<td>3.49 (0.75)</td>
</tr>
<tr>
<td>Compatibility</td>
<td>3.22 (0.74)</td>
<td>3.30 (0.73)</td>
<td>3.26 (0.67)</td>
<td>3.18 (0.46)</td>
</tr>
<tr>
<td>Complexity</td>
<td>2.65 (0.75)</td>
<td>2.77 (0.79)</td>
<td>2.61 (0.79)</td>
<td>2.61 (0.74)</td>
</tr>
<tr>
<td>Observability</td>
<td>2.89 (1.09)</td>
<td>2.67 (0.95)</td>
<td>2.56 (0.95)</td>
<td>2.59 (0.91)</td>
</tr>
<tr>
<td>Trialability</td>
<td>3.32 (0.80)</td>
<td>3.47 (0.72)</td>
<td>3.27 (0.65)</td>
<td>3.25 (0.84)</td>
</tr>
</tbody>
</table>

Differences Regional Perceptions of Diffusion Characteristics

ANOVARs between the regions and the diffusion characteristics were not statistically significant for relative advantage and compatibility. However, statistically significant differences were identified between region and complexity ($F (3, 1046) = 2.97, p = .03$), observability ($F (3, 1046) = 5.37, p < .01$), and trialability ($F (3, 1046) = 4.82, p < .01$). Post hoc tests identified the Northeast viewing GM science as more complex compared to the Midwest, and the South viewing GM science as more observable than the Midwest and West. Additionally, the Northeast viewed trialability as greater than the Midwest or West (see Table 3). There were no other statistically significant differences between regions.
Table 3

Follow-up Tukey-HSD between Regions and Diffusion Characteristics

<table>
<thead>
<tr>
<th>I</th>
<th>J</th>
<th>Mean Difference (I-J)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Complexity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Northeast</td>
<td>South</td>
<td>.13</td>
<td>.21</td>
</tr>
<tr>
<td>Midwest</td>
<td>.17</td>
<td>.05*</td>
<td></td>
</tr>
<tr>
<td>West</td>
<td>.16</td>
<td>.08</td>
<td></td>
</tr>
<tr>
<td>Observability</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>South</td>
<td>Midwest</td>
<td>.31</td>
<td>.00**</td>
</tr>
<tr>
<td>Northeast</td>
<td>.20</td>
<td>.07</td>
<td></td>
</tr>
<tr>
<td>West</td>
<td>.29</td>
<td>.00**</td>
<td></td>
</tr>
<tr>
<td>Trialability</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Northeast</td>
<td>South</td>
<td>.15</td>
<td>.08</td>
</tr>
<tr>
<td>Midwest</td>
<td>.20</td>
<td>.01**</td>
<td></td>
</tr>
<tr>
<td>West</td>
<td>.21</td>
<td>.00**</td>
<td></td>
</tr>
</tbody>
</table>

Note. *p < .05, **p < .01

Likelihood to Consume GM Citrus by Region

The majority of respondents in each region indicated they were not likely to consume GM citrus products (see Table 4). The only exception was the Midwestern respondents were split on whether or not they would consume GM citrus products. A chi-square between region and likelihood to consume GM citrus was not statistically significant, which indicated region of origin did not impact likelihood to consume GM citrus ($\chi^2 (3) = 6.12, p = .11$).

Table 4

Respondents Likely to Consume GM Citrus Products

<table>
<thead>
<tr>
<th>Region</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>South</td>
<td>253</td>
<td>39</td>
</tr>
<tr>
<td>Northeast</td>
<td>317</td>
<td>46</td>
</tr>
<tr>
<td>Midwest</td>
<td>254</td>
<td>50</td>
</tr>
<tr>
<td>West</td>
<td>227</td>
<td>43</td>
</tr>
</tbody>
</table>
Predicting Likelihood to Consume GM Citrus

The logistic regression model was statistically significant ($\chi^2(8) = 414.82, p < .00$) and could account for approximately 43.7% (pseudo-$R^2 = .437$) of the variance in likelihood of consuming GM citrus products. When accounting for the diffusion characteristics in the model, Midwest respondents were less likely to consume GM citrus products compared to Northeast respondents. Relative advantage, compatibility, complexity, and trialability were all statistically significant predictors of likelihood to consume GM citrus, but observability was not. As the relative advantage of GM science increased by one, the log odds of consumers likely to consume GM citrus products increased by 3.24. Additionally, as compatibility, complexity, and trialability increased by one, the log odds of likelihood of consuming GM citrus products increased by 1.98, 1.43, and 2.20 respectively. A full description of the results can be seen in Table 5.

Table 5

<table>
<thead>
<tr>
<th></th>
<th>$b$</th>
<th>Log Odds</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Midwest</td>
<td>-.53</td>
<td>.59</td>
<td>.01**</td>
</tr>
<tr>
<td>South</td>
<td>.21</td>
<td>1.24</td>
<td>.33</td>
</tr>
<tr>
<td>West</td>
<td>-.30</td>
<td>.74</td>
<td>.16</td>
</tr>
<tr>
<td>Relative Advantage</td>
<td>1.18</td>
<td>3.24</td>
<td>.00**</td>
</tr>
<tr>
<td>Compatibility</td>
<td>.70</td>
<td>1.98</td>
<td>.00**</td>
</tr>
<tr>
<td>Complexity</td>
<td>.36</td>
<td>1.43</td>
<td>.00**</td>
</tr>
<tr>
<td>Trialability</td>
<td>.79</td>
<td>2.20</td>
<td>.00**</td>
</tr>
<tr>
<td>Observability</td>
<td>.02</td>
<td>1.02</td>
<td>.83</td>
</tr>
</tbody>
</table>

Note. **$p < .01$**

Conclusions and Implications

With GM science as one of the few viable solutions to citrus greening, this research sought to examine the diffusion of the idea of GM science in different US regions to assist in developing extension programs that help producers communicate with consumers about GM science use in citrus production. Respondents in all four regions, South, Northeast, Midwest, and West, had neutral perceptions of the compatibility, complexity, trialability, and observability of GM science. This finding is reflective of consumers being unsure about the associated risks and benefits of GM science (Ruth & Rumble, 2016). Additionally, observability and trialability have been difficult for consumers to identify (Wieck & Walchi, 2002), which may explain the neutral perceptions. Similar to what was found by Rumble et al. (2016) respondents did positively perceive the relative advantage of GM science in the South, Northeast, and Midwest, but Western region respondents were neutral about the advantages. Based on Rogers (2003) description of the diffusion characteristics, the idea of GM science has likely diffused throughout the public more so in the South, Northeast, and Midwest compared to the West. However, the neutral perceptions of the
diffusion characteristics aside from relative advantage indicated the technology has not yet been fully adopted by the public. While statistical associations were noted between the regions for the complexity, observability, and trialability of GM science, the large standard deviation for the scores indicated that practical differences were not present. Although these regions have varying types of agricultural production (USDA, 2000), political climates, and news coverage of GM science (Crawley, 2007), the residents shared similar views toward the technology.

Regardless of region, at least half of the respondents indicated they were not likely to consume GM citrus, which could be devastating to the citrus industry if GM science were to be used to combat citrus greening. The regions with the highest percent of respondents reporting they would not consume GM citrus were the South and West. These regions include Florida, Texas, and California – the top three citrus producing states in the country (USDA, 2016b). This evidence indicates a possible disconnect between the consumers in these areas and understanding the severity of citrus greening in their communities and on their state economy. Since GM food will be labeled in the near future (Popken, 2016), consumers will be alerted if their citrus is GM and less likely to purchase it. If producers are able to save their groves with GM science but unable to sell their product, the industry will remain in distress.

Even though the South, Northeast, Midwest, and West had similar perceptions toward GM science and likelihood to consume GM citrus products, living in the Midwest was predictive of likelihood to consume the GM fruit. Compared to the Northeast, Midwest consumers were a little more than half as likely to consume GM citrus. This finding was supported by Midwest respondents viewing GM science as more complex and harder to try compared to the Northeast respondents. Viewing the diffusion characteristics in this way indicated diffusion of the idea of GM science would be less in the Midwest compared to the Northeast, when accounting for the diffusion characteristics (Rogers, 2003), and was supported by the regression model. The Midwest produces the highest yields of GM crops, like corn and soy, in the US (USDA, 2000), so this finding counters expectations that the residents of that area would be more supportive of GM science. A possible explanation is that Midwest residents may be more exposed to controversial discussions about use of GM science due to the amount of GM crops grown in the region, which makes them less likely to consume a GM product compared to the Northeast, where GM crops are not typically grown. Alternatively, this finding could be because citrus is not grown in the Midwest, and the residents do not see the connection or need for producing GM citrus. Further research is needed to explore and understand this finding.

Positive perceptions of relative advantage, compatibility, trialability, and complexity also increased odds of the likelihood of consuming GM citrus products. This finding differed from previous studies with college students where only compatibility was predictive of consumption (Rumble et al., 2016). This difference could be due to different values between college students and the general public. In addition, regional location was included in the analysis and may be accounting for variance in the model that was not accounted for in the study conducted by Rumble et al. (2016). Positive perceptions of relative advantage increased the odds of consumption by more than three, making it the strongest predictor, which was consistent with previous literature (Klerk & Sweeney, 2007). These findings supported the diffusion of innovations theory (Rogers, 2003) related to GM science and citrus greening.

Recommendations

If GM science is used as a solution for citrus greening, extension agents will need to facilitate difficult conversations in the future to address the issue. Most of the diffusion characteristics were viewed neutrally, which means polarized attitudes have yet to form for or
against the technology. However, consumers were not likely to consume citrus produced using GM science, which is concerning. Consumers likely have questions or concerns about GM science, which is why their attitudes were mostly neutral. Extension can serve the role as liaison between researchers and the public (Patton & Blaine, 2001; Welch & Braunworth, 2010) to address these concerns and provide people with relevant information about GM science to form educated opinions.

Limited differences in regional perceptions of GM science were identified, but citrus producing regions of the US had the highest proportion of respondents reporting they would not be likely to consume GM citrus products. In these areas in particular, extension agents should create educational and awareness campaigns that highlight the importance of citrus in these communities and the effect of citrus greening on local farmers. Consumers may be uninformed about citrus greening, which could create a disconnect for why their citrus would be GM in the first place. Similarly, extension agents in the Midwest could also work on educating residents about citrus greening and GM science. Specifically, educational campaigns should focus on complexity, observability, and trialability since these characteristics were viewed differently in the Midwest compared to other regions. Additionally, since Midwestern respondents were less likely to consume GM citrus products than Northeastern respondents, increasing the personal relevance of citrus greening could help consumers make educated purchasing decisions. One way to emphasize relevance would be explaining that as the disease continues to spread, orange juice prices will likely increase.

Relative advantage, compatibility, complexity, and trialability were all predictors of likelihood of consuming GM citrus. Extension programs should focus on these four areas to provide the public with appropriate information to make purchasing decisions in the future. To address relative advantage, extension agents could present information about citrus greening and potential solutions to the problem so consumers can better understand how and why GM science would be used in citrus. Inviting opinion leaders and bloggers in communities to tour orange groves affected by citrus greening is another way to demonstrate the potential need for GM science in the citrus industry. By inviting opinion leaders specifically, the information can be shared with a broad audience that the public would view credible (Rogers, 2003). Bloggers could also help spread the information received on these tours to their followers who may not have citrus groves in their communities.

Compatibility with GM science can be addressed through forum style discussions about the technology. Providing people a safe space to express their concerns about the use of GM science and have their questions answered by university researchers and local farmers would allow extension agents to discuss more than just the science. Discussing concerns based on values and beliefs would allow people to make informed decisions about the compatibility of GM science. Concerns about complexity could also be discussed at these types of events. Small, informal discussions with scientists at local coffee shops or diners are one way to encourage discussion and lessen the complexity related to GM science. These strategies could ease extension agents’ concerns about balancing consumers’ worries related to both values and facts (Brown et al., 2002).

Trialability of GM science may be difficult for consumers to recognize they are participating in (Weick & Walchi, 2002), and extension agents should consider providing opportunities for people to try and reflect upon eating GM food. Hosting lunch and learns could help people identify what foods have been developed with GM science and recognize what GM food they are exposed to on a daily basis. Additionally, if GM science is used with citrus in the future, extension agents will need to proactively provide opportunities for consumers to try the
fruit. Focusing on increasing trialability with opinion leaders would also help to increase the rate of adoption for GM citrus (Rogers, 2003).

Future research could utilize qualitative methods to gather deeper insight into people’s perceptions and knowledge of GM science and their likelihood to consume GM citrus. Future research should seek to understand why consumers in the Midwest were less likely to consume GM citrus compared to the Northeast. To best understand this phenomenon, focus groups and interview should be used to gain an in-depth understanding of how consumers in the Midwest and other regions develop perceptions toward GM science and decide whether or not to consume the product. Additionally, this study measured likelihood to consume GM citrus, but providing respondents with the opportunity to try a hypothetical GM citrus (and telling them it was not GM after the study if the products are not on the market yet) would give researchers a better idea of people’s behavior related to GM citrus consumption. This would help communicators and marketers best position GM citrus once they make it to market and provide extension the information needed to develop outreach related to GM citrus without losing time waiting to see consumers’ actual intent to consumer the citrus. Another research possibility includes hosting a science café or discussion about GM science and collecting information about knowledge and perceptions of the technology. This information could provide extension agents with guidance for program development around GM science. With the passing of the labelling law for GM food, another potential line of research would be to see if consumers notice the label and how that affects their purchasing behaviors.

While this survey used post-stratification weighting to lessen the effects of non-probability sampling, simple random sampling of the US population would help increase the generalizability of the study. This study was also confined to US residents alone. Replicating the survey in other citrus producing countries, or to countries the US exports citrus to, could provide valuable insight into cultural differences in perceptions of GM science. While differences in perceptions were not found between the identified regions in the study, analyzing perceptions of GM science between citrus producing states and non-citrus producing states could yield different results.

References


Shaping Pedagogical Content Knowledge for Experienced Agriculture Teachers in the Plant Sciences: A Grounded Theory

Amber H. Rice¹ & Tracy Kitchel²

Abstract

This grounded theory study explored the pedagogical content knowledge (PCK) of experienced agriculture teachers in the plant sciences. The most emergent phenomenon to surface from the data was the influence of beliefs on participants’ PCK. This central phenomenon became the cornerstone for the model of what was shaping experienced agriculture teachers’ PCK in the plant sciences. The three major components that shaped the participants’ PCK were: integrated belief systems, experiences prior to and during inservice, and the influence of the school and community context. A substantive level theory was developed that illustrated relationships between these three main components and their impact on participants’ PCK. Recommendations from this study include conceptualization of experienced agriculture teachers’ PCK for a variety of agriculture topic areas and exploration into the development of PCK in preservice and beginning teachers.

Keywords: Pedagogical Content Knowledge; Agriculture Teacher Pedagogical Content Knowledge; Teacher Knowledge

Introduction and Review of Literature

The most significant impact on student learning is the teacher and how they use their knowledge to teach (Darling-Hammond & Bransford, 2005). Research on teaching and learning has identified two primary knowledge bases important for all teachers to possess: subject matter expertise and pedagogical content knowledge (PCK) in a specific subject matter field (National Research Council, 2010). PCK is a teachers’ knowledge of content merged with knowledge of how to teach that content (Shulman, 1986). In his first article addressing PCK, Shulman (1986) discussed the historical emphasis on teacher content knowledge, describing exams used for teacher certification that focused primarily on content knowledge. He claimed research and reform efforts had since strayed away from valuing the content knowledge of teachers and challenged educators to reassess the importance of content knowledge in relation to pedagogy.

Since its introduction by Shulman (1986), various research studies have been conducted to further elaborate on the PCK construct. PCK research is one way to conceptualize the complexity of teacher knowledge necessary for teaching (Gess-Newsome & Lederman, 1999). PCK research can aid in creating a picture of what teachers do when teaching, relate teaching to student learning, and further establish content knowledge alone does not make an individual qualified to teach (Kind, 2009). Exploration of PCK in a variety of disciplines can contribute to a further understanding of the knowledge and skills that make teachers effective (Loughran, Berry, & Mulhall, 2012).

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Research has indicated ways to strengthen PCK in teachers could lead to increased student progress and student learning (Baumert et al., 2010; Hill, Rowan, & Ball, 2005).

PCK is not just important; it is arguably the most important knowledge base a teacher can possess. Specifically, in agricultural education, PCK is considered critical for effective teaching (Knobloch, 2002; Roberts & Kitchel, 2010). Agriculture teachers’ PCK influences their choice of teaching strategies, approach to curriculum, assessment methods, and knowledge of their student base, all within an agriculture context. An example of agriculture teachers’ PCK in the plant sciences, specifically within the area of greenhouse management and plant growth, could include knowledge of common student misconceptions. One student misconception related to this area is plants get their ‘food’ from the soil and thus need soil to grow (Driver, Squires, Rushworth, & Wood-Robinson, 1994). If an agriculture teacher is aware of this student misconception, they may choose to teach a lesson on hydroponics to demonstrate plants can grow without soil. They may also have students conduct experiments using different growing mediums in the greenhouse to demonstrate how they influence plant growth. Dispelling this misconception could pave the way for deeper conversations about photosynthesis. Knowledge of student misconceptions for a particular topic and the subsequent teaching strategies chosen to dispel those misconceptions are all grounded in agriculture teachers’ PCK.

Despite the importance of PCK illustrated in the previous example, the agricultural education discipline cannot describe what PCK agriculture teachers have or need to have for any topic within agriculture. Investigating experienced agriculture teachers currently in the field is an important first step in unpacking agriculture teachers’ PCK. In science education research, experienced teachers were consulted to develop documents representing detailed PCK for specific science topics such as genetics and electrical circuits (Loughran, et al., 2012). While experience in the field does not guarantee an individual will possess PCK, it does increase the likelihood PCK has been developed (Hashweh, 2005). A recent study in agricultural education investigating beginning teachers’ abilities to deconstruct content knowledge for student understanding concluded this process was impeded by teachers’ lack of content knowledge (Rice & Kitchel, 2016). This further substantiates the need to investigate experienced agriculture teachers. Additionally, because this study is focused on providing a foundation for future agricultural education PCK research, it is also important to study teachers with not only teaching experience, but with expertise in a specific agriculture topic.

**Purpose of Study**

The purpose of this grounded theory study was to conceptualize PCK for a specific topic in agriculture and develop a model for investigation and conceptualization of additional agriculture topics. The guiding question supports priority four of the 2016-2020 National Research Agenda—meaningful and engaged learning in all environments (Roberts, Harder, & Brashears, 2016): What is experienced agriculture teachers’ PCK related to the plant sciences?

**Methods**

The methods used in this study may be similar or identical to methods used in an extension of this study. I chose grounded theory as the research design because of the exploratory nature of my guiding question. PCK research in agricultural education has been limited to a handful of studies (Rice & Kitchel, 2016). Unlike other discipline areas, such as science education, there has not yet been a conceptualization of PCK for specific agriculture topic areas, including the plant sciences. Creating a substantive theory of PCK within the plant sciences has potential to pave the way for future agriculture topic areas to be explored. Additionally, PCK is rooted in the teaching
and learning process, and investigating a concept associated with a process is a defining tenant of grounded theory methodology (Corbin & Strauss, 2008). Specially, this study was guided by the work of Corbin and Strauss (2008), who view grounded theory as a way to understand complex social situations and experiences.

I approached this study from a pragmatic lens (Strubing, 2007). Grounded theory has a strong foundation in pragmatism and interactionalism (Strubing, 2007), further supporting this decision. In addition to my epistemological lens, it is also important to disclose my positionality because of its influence on my research (Creswell, 2013). I identify as a former high school agriculture teacher from a multi-teacher agriculture program with a strong background in plant science content. At present, I am employed as a teacher educator at a land-grant university. The goal of my research is to conceptualize the PCK of expert agriculture teachers so this information can be used to enhance preparation of preservice teachers and assist development of practicing teachers. My desire is for more agriculture teachers to feel they have the skills necessary to adequately understand and effectively teach agriculture content.

The sample was composed of eight high school agriculture teachers in Missouri with a minimum of eight years teaching experience. This specific experience range was appropriate for this study because expertise is understood to begin for teachers between five to eight years of teaching experience in the field (Darling-Hammond & Bransford, 2005). Also, the likelihood that teachers possess PCK increases with teaching experience (Hashweh, 2005). The teachers included in the study were purposefully selected using recommendations from teacher educators regarding teachers’ quality and possession of plant science PCK. Lastly, the location of the schools in which each of the study participants were located was limited to a 120-mile radius of the university. This geographical boundary increased the feasibility of the field work.

Data Sources and Collection

PCK is demonstrated across the planning, in-the-moment, and reflection phases of teaching (Carlson, Stokes, Helms, Gess-Newsome, & Gardner, 2015; Hashweh, 2005). Reflection is also a key input to PCK development (Schneider & Plasman, 2011; Van Driel & Berry, 2012). More specifically, knowledge, reasoning, and planning prompts explicit reflection on action and the act of teaching leads to explicit or tactful reflection in action (Carlson et al., 2015).

To adequately study agriculture teachers’ PCK in the plant sciences, the inclusion of data sources reflective of all three phases became important. Specifically, I drew on six sources of qualitative data: pre-observation interviews, classroom teaching observations, field notes, lesson artifacts, teacher journal reflections, and post-observation interviews with stimulated recall. Each data source occurred during one of the three aforementioned phases and thus contributed to the formulation of a comprehensive view of agriculture teachers’ PCK. Data were collected during fall 2014, which accounted for a single plant science unit for each participant. Plant science was identified as an appropriate disciplinary focus primarily because it is a common content area in Missouri taught by numerous experienced agriculture teachers. Secondarily, I had the appropriate content knowledge to recognize and study plant science PCK. Each participant was visited on six separate occasions (i.e., 48 total visits). Considering PCK is in part an internal construct (Baxter & Lederman, 1999), interviews became an essential data source (Padilla & Van Driel, 2011). Accordingly, I conducted semi-structured interviews with each individual participant. The interviews lasted between 45 minutes to an hour. I conducted pre-observation interviews before teachers initiated classroom instruction with the intent of capturing PCK emerging during the planning phase of teaching. An example of a pre-observation interview question was: What strategies will you use to facilitate student learning of concepts in this unit?
I captured PCK emerging during the in-the-moment teaching phase through classroom teaching observations. For example, if a student displays difficulty grasping a concept during a lesson, the teacher may or may not demonstrate PCK in response to addressing that difficulty by explaining the problem in a different way as the lesson unfolds. PCK is not always revealed during a single lesson observation (Loughran, Mulhall, & Berry, 2004). To increase the likelihood of viewing teacher PCK “in action,” I conducted two, two day observations of each participant. I video recorded the sessions I observed to enable iterative analysis of instances of PCK and stimulate recall during post-observation interviews. Additionally, I relied on field notes to document instances of PCK that emerged during the in-the-moment teaching phase not captured on video.

PCK is partially an internal construct, which makes its expression difficult to recognize (Kind, 2009). To capture such internal processing, I gathered two additional sources of data that spanned the entire plant science unit. First, I collected lesson artifacts to capture PCK during the planning and in-the-moment teaching phases of teaching (see Hume and Berry, 2011). Second, I relied on teacher journal reflections to illuminate instances of PCK throughout the reflection phase of teaching. The complexity of PCK required me to document the participants’ thoughts as the unit progressed. The participants responded to five reflection questions corresponding to each lesson in the unit immediately after its completion. An example of a reflection question was: How did this lesson connect to or build from your other lessons in this unit?

Lastly, I conducted post-observation interviews with stimulated recall to reveal instances of PCK during the reflection phase of teaching. I completed one-on-one semi-structured interviews lasting between 45 minutes to 90 minutes in length upon completion of the unit. For example, I asked the participants the following post-observation interview question: what do you feel were the strengths and weakness of this unit? Additionally, I showed each participant a minimum of three video clips from the two teaching observation blocks to engage their stimulated recall. Stimulated recall is an introspective technique that allows participants to articulate their thought processes and decision making after hearing and/or viewing a recollection prompt (Mackey & Gass, 2005; Meade, McMeniman, Wilson, Kanes, & Davey, 1991).

Data Analysis and Changes to Central Question

I engaged in data collection and analysis simultaneously consistent with the principles of grounded theory methodology (Corbin & Strauss, 2008). I analyzed data originating from all six data sources using a constant comparative process. This analytical technique involves data being compared against other data, beginning with the first piece of datum collected, with the intent of revealing similarities and differences (Corbin & Strauss, 2008). I used the three-step coding process (i.e., open, axial, selective) throughout my analysis (Corbin & Strauss, 2008). Open coding develops categories, axial coding connects categories, and selective coding creates a story ending in a developed theory (Corbin & Strauss, 2008). I used open coding to examine all data sources as they became available to develop initial codes. I then adapted my data collection and analysis to the point of reaching saturation specific to each idea that was revealed to be relevant to the research question (Creswell, 2013). Following the development of a preliminary set of categories, I articulated a pervasive phenomenon that served as the central piece of my theory (Creswell, 2013).

The first three interviews revealed to me that the plant sciences was not specific enough of a topic to be able to adequately describe the participants’ PCK and allow for comparisons between participants and the development of a theory. More specifically, the unit topics taught by the participants varied. Concurrently, a different phenomenon was exposed. The participants discussed during the pre-observation interviews their beliefs regarding agricultural education, which was surprising given that questions regarding orientations were purposefully left for the post-
observation interviews. During open coding, I also noticed this emerging theme of beliefs that appeared to influence teacher knowledge. A benefit of grounded theory, is the capacity to use a relatively broad research question to illuminate authentic and genuine trends within data (Creswell, 2013). Related, the researcher must remain flexible and willing to alter the original research question to reflect important phenomenon that unexpectedly emerges from the data. The original research question that I raised was: “What is experienced agriculture teachers’ PCK related to the plant sciences?” Following uncovering of the central phenomenon, I revised the guiding research question to become: “What shapes experienced agricultural teachers PCK in the plant sciences?” I then re-coded existing data and applied the new research question to all subsequent data collection and analysis activities.

I performed axial coding using my central phenomenon as a guide. Axial coding involves converging data in new, more meaningful ways that is reflective of context, conditions, and consequences (Corbin & Strauss, 2008). This process fosters a better understanding of the central phenomenon and how relevant categories are interrelated. I recorded memos throughout the entire research process and consistently reflected upon them throughout data collection and analysis. These memos were a crucial part of the data analysis process in that they aided me in recognizing how beliefs shaped participant PCK (Corbin & Strauss, 2008).

The final step in the coding process was selective coding. This phase was integral in developing the theory for this study. During selective coding, the researcher attempts to create a story from the data related to the central phenomenon (Creswell, 2013). I was able to establish linkages between my core categories and how they influenced PCK of the participants. During the selective coding phase, I asked follow-up questions of my participants in an attempt to answer any questions that still remained regarding the context and dimensions of my theory and to achieve saturation (Corbin & Strauss, 2008). Diagrams were utilized to display how the theory fit together and changed throughout the process. I attempted to reach a level of abstraction from the data (Corbin & Strauss, 2008) and tie together the different elements of the theory. The final result was the development of a substantive theory that explained the central phenomenon. This theory developed over time with assistance from participants, various models were developed as the study progressed, and follow-up questions were asked to refine lingering questions about connections in the data.

Validation Strategies

Creswell (2013) described evaluation measures specifically for a grounded theory study. These measures include: study of a process, coding process emerges from the data to the theory, theory is presented in a figure or diagram, a story line connects the categories, memoing is used throughout the process, theoretical sampling is conducted, and reflexivity and positionality are addressed. To meet the process criterion, I developed a research question associated with a process. Additionally, the pervasive concept that served as the central point to the theory was based around a social process. To meet the coding process criterion, I engaged in open, axial, and selective coding (Corbin & Strauss, 2008). I utilized rich, thick description of the data itself to demonstrate how the theory emerged from the data. I presented the theory as a diagram and a story line was used to connect the concepts of the theory. I used memoing throughout the research process and it was an instrumental tool in surfacing the central phenomenon, establishing connections between categories, and refining the overall substantive theory. I elected to not utilize theoretical sampling in the traditional sense of sampling additional participants to contribute to the developing theory, but instead used it as a means of sampling the existing data and focusing on events, incidents, and scenes that contributed to the developing theory (Fassinger, 2005). I addressed reflexivity and positionality by continuously reflecting on my own previous experiences with content knowledge.
and PCK to prevent my own biases from overshadowing the emerging data collection and analysis process.

Findings

Based on the three main themes (beliefs, experiences, and context) a theory was developed to describe what shapes experienced agriculture teachers’ PCK in the plant sciences (see Figure 1). Throughout the description of the findings, I elaborated on each of the three main themes in more detail including: connections between themes, the influence of those themes on the participants’ PCK, and finally how the three main themes coalesce to explain the overall substantive theory.

Figure 1. Substantive Theory behind what is Shaping Experienced Agriculture Teachers’ PCK in the Plant Sciences

The integrated belief systems theme was presented first because it was the most emergent theme in the study. This theme has previously been described, as it was the richest of the three themes and warranted a thorough unpacking in its own manuscript (Rice & Kitchel, in press). To achieve clarity in the connections between the three main themes and their contribution to the overall theory, I described the integrated beliefs system theme again in this manuscript.

Integrated Belief Systems and their Connection with Teachers’ PCK

The first major theme shaping the PCK of experienced agriculture teachers in the plant sciences was integrated belief systems. Integrated belief systems were comprised of three main components: beliefs about the purpose of agricultural education, beliefs about plant science education, and beliefs about teaching and learning in agricultural education. These three
components interacted with each other to form the participants’ integrated belief systems. After some contemplation and discussion with participants, it began to emerge that their individual beliefs regarding the purpose of agricultural education in general (not plant science specific) seemed to directly influence their other beliefs within the integrated belief systems. The participants’ specific beliefs about plant science education and beliefs about teaching and learning mirrored their overall beliefs about the purpose of agricultural education.

Beliefs about the purpose of agriculture included five different views: career preparation, college preparation, agricultural literacy, practical life skills, and student individualization. Clint demonstrated how important beliefs were to his teaching and the structure of his agriculture program. “I really pride this program on its ability to prepare a student to go to a 4-year college while that student is sitting right next to someone who is only going to graduate.” Beliefs about plant science education that emerged from the data included beliefs about the purpose of the school greenhouse (teaching lab vs. production facility), belief that science integration was an important component to plant science, and the belief that students possess more plant science prior knowledge than other agriculture subjects. When describing her balance of student work in the greenhouse, Allison said, “I think their primary role is to be students and learn the ends and outs, but I also think they obviously have to be the labor force behind everything you grow.”

Finally, beliefs about teaching and learning included: belief that it is the teachers’ responsibility to be a lifelong learner and reflector, belief that students played a substantial role in determining the agriculture content taught, and belief that students learn best through hands-on experience. Utilizing stimulated recall, the majority of participants described a variety of instructional strategies for teaching the same piece of content and all expressed aspects of their lessons they planned to alter for improvement. For example, James discussed in a post-observation interview that his students were not effectively grasping plant diseases and contemplated utilizing a disease triangle handout to increase student comprehension. To sum up the importance of reflection Clint stated, “I truly believe sincerely practicing daily reflection of the educational process leads to pedagogical growth as a professional.”

Experiences Prior to and During Inservice and their Connection with Teachers’ PCK

Many of the participants’ experiences prior to inservice directly influenced the participants’ PCK in the plant sciences. One participant in particular, Clint, often discussed the role of his own high school experiences on his PCK. Clint provided justification for relying heavily on his high school experiences. “I believe the way I learned in high school, or still learn, is not much different than the way these students are learning…. I was a run of the mill average student.” Since Clint considered himself the “average” student, he felt the way he learned best was also the way his students’ learned best. Consequently, he felt a need to develop strategies to teach content in that way. Experiences prior to inservice, particularly teacher preparation, did not always have the influence on PCK the participants’ expected. For example, my first question in my pre-observation interview with Cora was, “Tell me a little bit about your background as a plant science teacher.” Cora’s answer to this question took an unexpected turn when she voiced her lack of preparation in plant sciences after college, “When you come out as an ag teacher you feel overwhelmed in that you have so many different areas you have to teach, you have not been able to specialize.” This quote acknowledged that while experiences prior to inservice could influence participants’ PCK, they may not always have the influence teacher educators expect.

Experiences in the classroom also directly influenced participants’ PCK. Specifically, classroom experiences developed knowledge about student misconceptions with content and ways to present content to counteract student misconceptions. In a journal reflection, Dawn described
how her classroom experiences with student misconceptions altered her teaching strategies for approaching that content. “Students were having a difficult time understanding basic plant science concepts and plant parts. The 2nd day of the lesson, I brought in cuttings so students would have visual representations of the various plants.” Experiences in the classroom directly related to the participants’ knowledge of content and students. Many of the participants described the use of visual examples and real life applications as effective ways to teach agriculture content. Dawn said, “I try to make analogies which would relate specifically to students’ home situations or items they can relate to outside of the school setting.” Another important influence of experiences on PCK development is simply the experience of teaching the content. Cora described how she sequenced the content for her greenhouse class, and why she sequenced the content in that particular way. When I asked where she developed the knowledge to complete this task, she replied “through experience in the classroom.”

Professional development experiences also directly influenced participants’ PCK. Cora illustrated just how important a greenhouse course was on her plant science PCK. “I knew that I was going to get a greenhouse and so I made sure to sign up that summer to take that class.” Cora went on to describe how she utilized experts to help her gain the necessary PCK to teach students how to raise poinsettias. However, professional development for mid-career teachers was a concern for participants. Dawn, Kelly, and Allison all mentioned a desire for professional development that focused on teachers with over 5 years’ experience. Allison commented, “I don’t typically go to professional development for greenhouse or things like that because most of the time it’s lower than what I need.” The point in time that the participant learned the content in their career was another contextual component that influenced participants’ PCK. Cora reflected on her experiences taking a greenhouse class as a beginning teacher. “I wish I had time to go though as a refresher because there are so many things now that I took away as a beginning teacher that would be totally different from what I would take away now.”

Contextual Influencers and their Connection with Teachers’ PCK

The most emergent contextual influencer in agricultural education was the role of the community, specifically the type of agriculture in the community (e.g. forages production or local greenhouses). Clint summarized its influence, “To be successful I believe you have to have a needs assessment, know what the needs of this community are agriculturally, and that’s what you teach.” Allison and Dawn mentioned their advisory councils, which are bodies of community stakeholders that meet periodically and advise the local agriculture teacher(s) and programs (Talbert, Vaughn, & Croom, 2005). These councils can also influence the PCK a teacher develops because of their potential direct influence on the agriculture program. Sometimes the community had specific expectations. Clint, who had a substantial community influence on his program said, “Parents, alumni, community members, ag community, they expect students to leave this program knowing about forages.” This attention to the livelihood of the community altered the quantity, quality, and depth of PCK participants developed for a topic area.

Another contextual influencer specifically related to agriculture is the structure of career development events (CDEs) through FFA as an intra-curricular part of agricultural education. The participants varied in the amount of influence CDEs had on their PCK. James said, “I would say CDE’s play a significant role as the objectives for many CDE’s are the same as major parts of my classes.” Many of the participants also chose the students to compete in career development events from their classes and utilized teaching the contest as a way to get students engaged in learning the content. CDEs for Missouri agriculture teachers involved more than just FFA involvement and application of curriculum. In Missouri, CDE results of students influenced funding for agriculture
Rice & Kitchel  Shaping Pedagogical Content Knowledge …

programs. This assessment method contributed to the type of knowledge participants developed because many felt the need to teach to the test.

In addition to agriculture specific contextual influencers, there was also the influence of the participants’ school structure and available resources. Being in a multi-teacher or single teacher program influenced PCK. Dawn said, “If you’re a single teacher, you need to be broad-ranged. For me, I knew I wanted to teach in a multi-teacher [agriculture program] and I knew that’s where my interest areas were so it made it a lot easier to specialize.” It is interesting to note that all of the participants in the study who were purposefully selected because they demonstrated strong PCK in plant sciences were all located in multi-teacher programs and had the opportunity for the majority of their careers to specialize in plant sciences. Related to the type of department was the type of school. Participants who emphasized content or skills based professional development were all based at area career centers. Facilities and monetary resources influenced participants’ abilities to seek out professional development opportunities and invest in supplies for their classroom. CASE, an agriculture instructional curriculum, had a cost attached to preparation and implementation. Dawn expressed cost and limited resources were barriers to her pursuing this type of curriculum, which focuses on science applications of agriculture. If participants were operating under a constricted budget this influenced the type of activities they did in their classroom, which also limited their PCK for various teaching methods in plant science.

Summary: Connection of Themes to the Substantive Theory

Within this substantive theory, all three themes (beliefs, experiences, and context) influenced PCK directly in a variety of ways. Additionally, experiences can alter beliefs, beliefs can determine experiences pursued, and teachers are always developing new knowledge for teaching within a particular context. Development of PCK occurs over the course of a teachers’ entire career. The first experiences participants surfaced as having a profound influence on shaping their PCK began with their high school agriculture classes, with the exception of participants who grew up on a production farming operation. These experiences prior to inservice directly influenced PCK. Experiences during inservice were more heavily influenced by context and had linkages with the integrated belief system. Contextual influencers unique to agricultural education such as FFA, CDEs, and the community context were a critical part of this overall model because they heavily influenced the other components. Finally, the integrated belief system was the most emergent phenomenon in the overall theory with beliefs about plant science education and beliefs about teaching and learning in agricultural education mirroring beliefs about the purpose of agricultural education.

Discussion

The substantive theory developed from this study depicted PCK as a continuously evolving fluid knowledge base throughout a teachers’ career. This echoes findings from previous studies in other educational disciplines that describe PCK as an ongoing cyclical process (Hashweh, 2005; Lee, 2011). The three main themes involved in the PCK shaping process that emerged from this study (beliefs, experiences, and context) have been included in various PCK studies and models; however, there has been a lack of depth when examining these shapers of PCK in the literature (Friedrichsen, Van Driel, & Abell, 2010). Overall, the influence of the integrated belief systems on participants’ PCK warrants further attention to teacher beliefs in future preservice teacher education and inservice professional development. These individual beliefs could be seen throughout various data sources and greatly impacted the various strategies the participants utilized in the classroom. Because of the personal nature of beliefs, it is possible many agriculture teachers have not discussed how these beliefs impact their teaching.
Experiences also had a significant influence on the participants’ PCK. Grossman (1990) identified sources of PCK development including: classroom observations, university coursework, experiences in the classroom inservice, and professional development. All of these sources were mentioned by participants in some capacity as influential sources of PCK. One source that may be unique to agricultural education is the influence of participants’ high school experiences in agricultural education on their PCK. Multiple participants expressed their first sources of plant science knowledge were their high school experiences and they often taught in similar ways to their high school agriculture teacher, even James who had been teaching for 28 years. This is consistent with teaching and learning literature that stated the majority of teachers will teach in ways similar to how they were taught as students (Darling-Hammond & Bransford, 2005) and high school experiences were an important source of content knowledge and PCK for inservice agriculture teachers (Rice & Kitchel, 2015). However, utilizing high school experiences as sources of knowledge could be problematic as both agriculture content information and pedagogical information changes over time.

While teacher preparation programs are an important source of knowledge for agriculture teachers (Rice & Kitchel, 2015), data from this study indicated they may not have as much of an influence on PCK development as could be anticipated. The most influential teacher preparation experience from all participants was student teaching, which is consistent with agricultural education literature (Edwards & Briers, 2001). Student teaching was when many of the participants began heavily engaging in the learning and reflecting process and when they were able to apply their newly forming PCK to teaching real-life students.

All of the participants in this study were in multi-teacher programs. This was not planned as these teachers were simply recommended as having PCK in the plant sciences, were located within close proximity to the university so field work could be conducted, and had at least eight years of classroom experience. It is possible that being located in a multi-teacher program positively affected their PCK development because the participants had more of an opportunity to specialize in fewer areas of agricultural education. Since PCK is topic specific (Carlson et al., 2015; Etkina, 2010; Van Driel & Berry, 2012), developing PCK in a variety of agriculture topics within various content areas could be challenging, particularly in a single teacher program. However, the reality remains that many agriculture programs across the nation are still single teacher programs and those teachers are responsible for teaching a variety of agriculture content.

Finally, context greatly influenced the PCK of experienced agriculture teachers. Since the beginning of agriculture programs, agriculture teachers have been encouraged to utilize their teaching autonomy to design their agriculture programs around their local communities (Talbert et al., 2005). Talbert et al. (2005) also claimed that even in states with mandated curriculum the local agriculture teachers should practice autonomy and address local community needs. This common desire to teach to the needs of the local community had interesting implications on participants’ PCK. If the surrounding community had careers available in agriculture, the participants were more likely to include a career or college preparatory focus as their purpose of agricultural education. Particularly in the plant sciences, the community influenced what the participants grew in the greenhouse, contributed to the participants’ decision to utilize the greenhouse for production vs. laboratory, and often provided important supplemental knowledge to the participants in the plant sciences. Talbert et al. (2005) acknowledged agriculture teachers cannot know everything about their subject matter and emphasized the importance of local community partnerships to supplement knowledge.

Depending on the influence of the local community, participants in the study sought out different types of knowledge and engaged in different professional development experiences. Clint
for example, who was located in a community with substantial forage production, described professional development he attended specifically in grasslands to better meet the individual needs of his community. Additionally, participants expressed a desire to teach to the interests and needs of their students, which related to the local community influence. If the agricultural education discipline as a whole desires to maintain a community focus, then tools for knowledge development related to individual communities must be provided to preservice teachers by teacher preparation programs. Additionally, encouragement to develop advisory councils, a groups of stakeholders in the community that advise agriculture programs (Talbert et al., 2005), could also assist beginning teachers in meeting the needs of their communities.

**Recommendations for Practice**

Clint discussed that he engaged in agriculture experiences outside of his strength areas and made an effort to develop new content knowledge and PCK. Kelly and Dawn also supplemented their knowledge with work experience during college and held the belief that teachers should be lifelong learners and reflectors. If current preservice teachers are not inherently engaging in this type of behavior, as predicted by Cora and Clint, it is partially the responsibility of teacher preparation programs to provide assistance. Perhaps an exam when students enter teacher preparation programs to identify weaker areas of content or advising sessions that address the need for additional knowledge in agriculture content during college could assist future teachers. Teacher preparation plans of study often include elective courses in agriculture content that could also be utilized to enhance content knowledge and PCK if purposefully selected. For students who do not come from agriculture backgrounds, internships and work experiences during college could be a way to supplement their agriculture knowledge and should be encouraged by teacher educators.

While experiences prior to inservice did have an influence on participants’ PCK, experiences in the classroom during inservice were the most influential experiences, which is consistent with previous literature (Gess-Newsome & Lederman, 1999; Hashweh, 2005). These experiences were especially impactful when they were combined with in-depth reflection (Hashweh, 2005). It is again recommended that teacher preparation programs provide preservice teachers with the tools to reflect on practice and establish the need for reflecting on practice during inservice. It should not be assumed by agriculture teacher educators that preservice teachers will develop positive reflection habits on their own.

PCK development is not complete when students graduate and receive their initial teacher certification. In fact, the PCK development trajectory continues to occur long after teacher preparation (Abell, Rogers, Hanuscin, & Gagnon, 2009). Therefore, it is recommended the quantity and quality of professional development for inservice teachers should also increase. There is evidence from the literature that professional development can impact the PCK of beginning teachers (Clermont et al., 1994). The participants in this study also indicated that professional development for mid-career teachers was not always applicable to their situations. They expressed a desire for professional development that delved deeper into the content, professional development separate from beginning teachers when appropriate, and lower cost associated with professional development. Popular professional development programs, such as CASE, were not explored by the participants in this study primarily due to cost. Teacher preparation programs, agriculture content professors, state agriculture staff, and community stakeholders should collaborate to develop professional development that is useful for teachers at all stages of their careers.
Recommendations for Research

Part of the struggle with PCK research is capturing this illusive knowledge base (Kind, 2009). The exploratory nature of this study also led to thoughts on future data sources for PCK. Conducting lesson creation and analysis similar to Friedrichsen and Dana (2005) or completing CoRe or PaPeRs (Loughran et al., 2004) might be helpful in examining PCK more specifically for an agriculture topic. This data source could also supplement classroom observations. Journal reflections were a surprisingly insightful data source for participants in this study. If journal reflections contain directed questions and teachers are given adequate time to complete the reflection, this could be a valuable data source for future agricultural education PCK research. It might also be interesting to examine beginning teachers’ reflections and compare them to experienced agriculture teachers’ reflections.

Examination of what shapes PCK specifically in agriculture teachers can serve as a starting point for future PCK development studies specifically in agricultural education. Data from this study points to inservice experiences as the most impactful type of experience, but teacher preparation programs and student teaching did serve a role in shaping participants’ PCK. This substantive level theory can be utilized as a guide for both future research and as knowledge for teacher preparation programs. The data from this study also raises philosophical questions about the true purpose of agricultural education and how these beliefs influence teacher PCK and subsequently classroom teaching. There is a need to explore teacher beliefs about the purpose of agricultural education more in-depth because of the influence it had on the other components of the integrated belief system and the other themes shaping PCK. It is uncertain when these beliefs begin to develop and what has the most impact on these beliefs.

Finally, there is a need for further PCK research in agricultural education. Conceptualization of experienced agriculture teachers’ PCK for a variety of agriculture topic areas, including plant science, is still needed in the agricultural education discipline. Additionally, exploration into the development of PCK in preservice and beginning teachers will also be critical future research. Data from this study surfaced influencers of PCK that may be unique to the agricultural education. Examining the influence of high school experiences on PCK, community influence and teacher autonomy on PCK, and the tradition of manual skill development and career preparation on PCK could provide important knowledge not only for the agricultural education discipline, but also the body of PCK research as a whole.

References


Perceptions of Agricultural Leadership Academic Programs of 1862 Land-Grant Universities

Jackson C. Alexander¹, K. Jill Rucker², Donna L. Graham³, Jefferson D. Miller⁴, & Jason K. Apple⁵

Abstract

This study characterized perceptions of agricultural leadership programs in colleges of agriculture, food, life, human, or environmental sciences at 1862 land-grant institutions. Objectives included describing the need for programs, studying evolution within the discipline, discussing faculty recommendations for future development, and examining why programs are relevant. Qualitative data were analyzed using thematic analysis, which included open and axial coding. A total of 26 academic agricultural leadership programs were identified, and a telephone interview was completed by 19 agricultural leadership faculty members. Results of the study indicated agricultural leadership was historically founded under the umbrella of agricultural and extension education but also evolved from a need in industry. The discipline evolved because the academic subject matter was broadly appealing to students and, and its growth was also spurred by the popularity of community and rural leadership development programs. To improve agricultural leadership programs, faculty surveyed recommended collaborative efforts across the discipline to establish a unified vision and a national professional organization. Throughout the interviews, themes emerged related to the relevancy of agricultural leadership programs in higher education: (1) The agricultural leadership discipline creates leaders through developing “human capital,” and (2) graduates promote industry growth through their political, policy, and public influence. Future recommendations for research included identifying perceptions of agricultural leadership beyond the scope of 1862 land-grant institutions.

Keywords: agricultural leadership, academic programs, industry needs, 1862 land-grant institution

Introduction

Agricultural leadership programs have roots at land-grant universities within agricultural education departments but have shifted from primarily educating rural youth to educating undergraduate and graduate students on becoming empowered community members (Velez, Moore, Bruce, & Stephens, 2014). As early as 1989, the Strategic Plan for Agricultural Education

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suggested a need to “amplify and expand the whole person concept of education, including leadership” (National Summit on Agricultural Education, p. 4). In 1994, Brown and Fritz indicated leadership courses and programs offered by departments of agricultural education were well-received and were continuing to climb in both stability and growth. Many higher learning institutions have exhibited a commitment to promoting leadership development programming and preparing societal leaders for future generations (Astin & Astin, 2000).

Identifying historical structures and current realities shaping perceptions of agricultural leadership programs is imperative to understanding how to lead these programs into the future (Williams, Townsend, & Linder, 2005). As Nahavandi (2006) noted, a stronger understanding how leadership develops in differing cultures, programs, and organizations is of utmost importance to understand the context of leadership programming. Yet, while the agricultural leadership discipline has enjoyed success, there is a lack of research-based literature on program objectives, courses offered, perceptions of programming, placement of graduates, and need for programs (Morgan, King, Rudd, & Kaufman, 2013).

The American Association for Agricultural Education (AAAE) and the Association of Leadership Educators (ALE) both produced national research agendas that encompass areas important for agricultural leadership programs. The National Research Agenda (Roberts, Harder, & Brashears, 2016) Priority 5: Efficient and Effective Agricultural Education Programs addresses the need to develop effective academic programs to advance the career, developmental, and academic needs of diverse learners. Additionally, Priority 6: Vibrant, Resilient Communities addresses the need for communities to have trained leaders to ensure the opportunities for educational and career development experiences for community members. Additionally, the National Leadership Education Research Agenda set forth research priorities to assist in guiding a more structured approach to understanding and teaching leadership (Andenoro, et. al., 2013). The NLEA research priorities are divided into seven primary areas, (1) teaching, learning and curriculum development; (2) program assessment and evaluation; (3) the psychological development of the leader, learner, and follower; (4) the sociological development of the leader, learner, and follower; (5) influences of social identity; (6) social change and community development; and (7) global and intercultural capacity (Andenoro et al., 2013). Leadership research within the agricultural education context needs to explore these priorities with a special emphasis on training, student development, and program growth (Spotanski & Carter, 1993).

Kaufman, Rateau, Ellis, Kasperbauer, and Stacklin (2010) suggest more research must be conducted to clarify the understandings and benefits of agricultural leadership programming. Moreover, Williams, Townsend, and Linder (2005) suggested further qualitative study should be conducted to include known leaders within the field to better understand knowledge of the discipline. By soliciting input from agricultural leadership experts, one might better understand career focus and placement for graduates, objectives of programming, courses taught related to agricultural leadership, and perceptions held by associates within the discipline (Morgan et al., 2013).

Theoretical Framework

Leadership programming has been shaped by theories, models, and methods that have changed and developed as the discipline continues to evolve (Clark, 2001). Two theories guided this study: Ajzen’s Theory of Planned Behavior (TPB) and Bloom’s Taxonomy. Both theories are useful for examining human behavior, especially decision-making and learning. Ajzen’s theory focuses on intentions that represent the motivations of individuals about their conscious plans or decisions to begin a certain behavior (Ajzen & Madden, 1986; Ajzen, 2006). According to Conner...
and Armitage (1998), the Theory of Planned Behavior has experienced a high degree of success in predicting and explaining varieties of behaviors, and the TPB model serves as a solid framework for creating plans to change behaviors, which is one of the ultimate purposes of any educational curriculum. Krathwohl (2002) described Bloom’s Taxonomy as an aid to academic disciplines by serving as a growth model, and contends the theory puts forth a multi-tiered model to explain the processing people go through.

**Theory of Planned Behavior (TPB)**

The TPB model explains that behavioral beliefs, such as a person’s belief that an action will result in a positive practical outcome, are important motivational factors that influence a given behavior. Positive behavioral beliefs are likely to result in behavior change. Normative beliefs—a person’s understanding of social norms—also highly influence individual motivations. In particular, peers’ or societies’ expectations of a given outcome typically have a significant impact on a people’s decisions to change their behavior. These social norms represent a code of human behavior, and they are considered to be the standard of a given group of people.

Ajzen’s TPB provides a lens through which the growth and development of the agricultural leadership discipline can be viewed. Faculty members developed leadership degree programs and curriculum at higher-learning institutions by making behavioral decisions based on perceived industry and student needs. The theory explains that “normative beliefs result in perceived social pressure.” Essentially, if a person finds a particular attitude or situation more favorable as a norm, the person’s intentions will more likely be focused toward performing the behavior in question (Ajzen, 2006). The agricultural leadership discipline has grown in national popularity as the trend to develop agricultural leaders in departments of agricultural education has begun to become the norm. Faculty and departments also appear to have been motivated by the prospect of developing successful programming, and that prospect equates to a growing behavioral belief that may be guiding decisions to create their own agricultural leadership curriculum and degree programs.

Within the agricultural leadership discipline, many students and faculty members come from a rural background or have been associated with youth leadership programs such as 4-H or The National FFA Organization (Connors & Swan, 2006). Just as Ajzen and Madden (1986) explained, social pressure from peers to conform to the norm is often a strong motivational factor; therefore, it is plausible faculty and academic departments may have chosen to participate in the agricultural leadership discipline because (1) the academic subject matter was familiar and (2) because, as they observed their peers at other institutions working in this emerging discipline, they began to view teaching leadership in association with agricultural education as something that was socially normal and, in terms of behavioral belief, represented an effort that was likely to succeed.

**Bloom’s Taxonomy**

With history traced back to 1956, Bloom’s Taxonomy has served as a model for academic growth (Forehand, 2005). Often thought to be an accurate model for the examination of higher-order thinking and learning, Bloom’s Taxonomy is widely applied to teaching and educational applications across an array of academic disciplines and programs (Krathwohl, 2002). Additionally, according to Conger (1998), qualitative studies framed through Bloom’s Taxonomy are optimum for understanding perceptions related to leadership development programming

Bloom’s Taxonomy divides the process of learning into categories, or levels, of cognition, arranged from simplest to most complex (Krathwohl, 2002). These six levels include: remembering, understanding, applying, analyzing, evaluating, and creating. The general concept
related to these levels of learning is that teaching and learning efforts must progress through the lower levels in order to achieve higher-order learning and critical thinking.

Ricketts and Rudd (2002) asserted that Bloom’s Taxonomy can serve as a “comprehensive” model for formal and informal leadership education curriculum and programming, which will add to the arsenal of elements making up a leadership education program (Ricketts & Rudd, 2002). Moreover, Bloom’s model aligns with the idea if leadership curricula are to be used as components of a larger leadership development degree program, close attention should be paid to the order in which those educational components are presented to students. With levels of course content in mind, course offerings and rotations should fit with the goals and objectives of the overarching degree program. For example, concepts from leadership courses offered early in the program could be applied in experiential learning curricula such as internships and service-learning courses offered near the end of the program (Lindsay, Foster, Jackson & Hassan, 2009). Similarly, at the programmatic and disciplinary levels, Bloom’s Taxonomy dictates that growth should first occur with a focus on the basic foundations of a program or discipline, then progress to deeper, more complex aspects.

Purpose and Objectives

The purpose of this study was to identify and characterize the current agricultural leadership academic programs in colleges of agriculture, food, human, life or environmental sciences at the undergraduate and graduate levels. The study encompassed programs which offered certifications, specializations, concentrations and options focused in agricultural leadership. Three research objectives guided the study, which included:

1. Describe the need for the development of agricultural leadership programs at land-grant universities;
2. Describe agricultural leadership’s discipline-wide evolution regarding curriculum, training, teaching practices, and courses offered;
3. Describe faculty members’ recommendations on what should be developed or changed to holistically advance curriculum and update programming efforts within the field for future improvement and growth of agricultural leadership programs by analyzing their outlooks for the future of the discipline.

Methods

While qualitative studies are somewhat rare in the leadership discipline because of being time intensive and complex, these types of studies are optimum for understanding perceptions related to leadership development programming (Conger, 1998). This study employed a qualitative approach using interviews as the primary data collection method and thematic analysis of open- and axial-coded data as the primary data analysis method. Qualitative methodologies are integral in collecting data for developing a more complex understanding of a specific topic rather than a generalized, broad perception (Patton, 2002). Therefore, qualitative methods allow the researchers to conduct research in a natural fashion so both data and themes emerge with detail, thus leading to a richer research experience. Interviews, in particular, provide insights into a given culture, group, or organization. Interview results can be better understood through the interpretation of qualitative data (Hertz & Imber, 1995).
Subject Selection

In the U.S., there are 50 1862 land-grant institutions with a college related to agriculture, food, life, human, or environmental sciences (APLU, 2015). Each college’s website was searched for the presence of an undergraduate or graduate degree, specialization, concentration or option in leadership. Each university that offered programs where students could receive academic credit for a program related to agricultural leadership were contacted (N=26). Of the 26 identified schools, faculty or administrators at 22 schools agreed to participate in the study and provided names of faculty working in an agricultural leadership program for the interview.

Initial permission was obtained from department heads or administrative deans in the colleges to administer a survey and follow-up interview of an agricultural leadership faculty member at their institution. Faculty members in colleges of agriculture who have taught leadership courses, advised graduate and undergraduate students, and created leadership curriculum were purposively selected as the target population. Four institutions declined to participate in the study, and three individuals did not schedule an interview. This resulted in a 73% (n=19) response rate of institutions that participated in the interview.

Data Collection

Telephone interviews were conducted with the agricultural leadership faculty members at a convenient time identified by the faculty. The interviews were guided by a brief demographic questionnaire and by a questioning route, both conceived by a team of researchers with interests in agricultural education, communications and leadership. The questionnaire and interview questions were formulated so they most concisely elicited responses addressing the objectives of this study. To protect human subjects, Institutional Review Board approval was obtained from the researchers’ institution for both the questionnaire and the interview questioning route. Faculty members were emailed the interview questions in advance of their telephone interviews, which were conducted within a timespan of approximately two weeks. Each interview was recorded and transcribed in its entirety, and field notes were recorded by the interviewer. Researchers then emailed the transcript back to each faculty member to check for accuracy and clarity as recommended by Glesne (2006). Upon final approval from each faculty member, formal data analysis was ready to begin.

Data Analysis

To add organization to the analysis and reporting process, each interview participant (n=19) was assigned a number, which corresponded to the order in which they completed their interview. For example, the first respondent would be represented as “F1.” Quantitative data from the questionnaire were analyzed via simple frequency counts, and qualitative data were analyzed using thematic analysis, including open and axial coding. According to Creswell (2007), open coding is the first step in the data analysis process and involves segmenting interview transcriptions into themes or categories of specific information. Axial coding is the step that follows open coding, where researchers examine the identified themes drawn from open coding and create a central phenomenon to better understand what influenced or caused these segmented pieces of information to take place. Using the NVivo 11 software, the researchers placed words and phrases into categories to identify patterns, and, as each interview transcript, along with field notes taken by the interviewer, was analyzed, words and phrases were matched with similar themes and phrases to align with excerpts with like meanings and opinions.
Credibility, Dependability, and Trustworthiness

Because each interview situation is unique linguistically, socially, and psychologically, each participant and researcher experience will be vastly different based on the numerous unforeseen environmental factors, which might occur throughout the research process (Anderson & Jack, 1991; Glesne, 2006). However, steps can be taken in qualitative research to help ensure the quality of the findings. To establish credibility and dependability in this study, the researchers used peer review of the data collection instruments as well as of the analysis of the findings. Member checks were also used to establish the credibility and trustworthiness of the data. The researchers also added another layer of trustworthiness and credibility by analyzing the transcripts in NVivo 11. This provided an audit trail (Lincoln & Guba, 1985) of the analysis process, which was reviewed in summary by the team of researchers. When working to identify open and axial codes emerging from the 19 interviews, the researchers were able to verify, or triangulate, the data understand the results of the study as recommended by Patton (2002).

Findings/Results

There are 26 land-grant institutions with agricultural leadership academic programs housed in a college of agriculture, food, life, human, or environmental sciences. A total of 22 programs initially participated in the study (see Table 1), with 19 participants representing 19 programs completing the entire interview process. Of the 19 participants, five were female while the other 14 were male. The leadership programs have faculty members who serve in various roles such as department head, program coordinators, and assistant, associate, and full professors. Specifically, the subjects included one instructor, eight assistant professors, three associate professors, and seven professors.
### Table 1

**Agricultural Leadership-Related Programs at 1862 Land-Grant Institutions.**

<table>
<thead>
<tr>
<th>School</th>
<th>Major</th>
<th>Minor</th>
<th>Graduate Degree</th>
<th>Concentration/ Specialization</th>
<th>Certificate</th>
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<td>Auburn University</td>
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<td>Mississippi State University</td>
<td>X</td>
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<td>Concentration</td>
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<tr>
<td>New Mexico State University</td>
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<tr>
<td>North Carolina State University</td>
<td>X</td>
<td>X</td>
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<td>Concentration</td>
<td>X</td>
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<td>Oregon State University</td>
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<td>X</td>
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<td>Specialization</td>
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<td>X</td>
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<td>The Ohio State University</td>
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<td>The Pennsylvania State University</td>
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Three research objectives guided this study. Each of the corresponding research questions yielded varying themes or, “nodes,” as they are called in the NVivo 11 software. Nineteen (n=19) of the possible 26 (N=26) institutions participated in the qualitative interview, which created a response rate of 73 percent. A thorough analysis of the interview data gleaned five overarching areas directly corresponding with each of the interview questions and objectives of the study. Under the five main areas created, the researcher identified a total of nine “nodes,” or themes, with three of those themes containing a deeper “node,” or sub-theme. Table 2 represents the structure of themes that emerged from the analysis, as well as the frequencies of certain themes.

Table 2

Common Themes of Faculty Perceptions of Agricultural Leadership Programming

<table>
<thead>
<tr>
<th>Themes</th>
<th>Sources</th>
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<tr>
<td>Creation of Agricultural Leadership Education</td>
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<tr>
<td>• Industry Need for Agricultural Leadership</td>
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<td>• Historical Roots from Agricultural and Extension Education</td>
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<td>13</td>
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<td>Evolution of the Discipline</td>
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<td>• Maturity and Growth</td>
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<td>▪ Community and Rural Leadership Development</td>
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<tr>
<td>Recommendations for Future Growth</td>
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<tr>
<td>• Collective Collaboration</td>
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<td>▪ Creation of a Home</td>
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<tr>
<td>• Unified Vision for the Agricultural Leadership Education</td>
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<td>26</td>
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<tr>
<td>▪ Experiential and Service-Learning Opportunities</td>
<td>7</td>
<td>10</td>
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<td>Outlook of Ag Leadership Education</td>
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<tr>
<td>• Growth in Varying Capacities</td>
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<td>Relevancy of Agricultural Leadership Programs in Academia</td>
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<td></td>
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<tr>
<td>• Creating Leaders through Human Capital</td>
<td>15</td>
<td>23</td>
</tr>
<tr>
<td>• Political, Policy and Public Influence</td>
<td>6</td>
<td>11</td>
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</table>

Creation of Agricultural Leadership

Two major themes emerged regarding the growth of the agricultural leadership programs: (1) direct connection to agricultural and extension education, and (2) need for leadership skills in the agricultural industry.

Regardless of the structure and organization of each faculty respondent’s academic department, respondents indicated the agricultural leadership discipline draws strong roots from both the agricultural and extension education disciplines. Six respondents (F2, F4, F7, F15, F16, F20) indicated this direct connection to the agricultural and extension education disciplines as key factors in the growth of the agricultural leadership programs. The agricultural and extension education disciplines are well-established and have a strong history of providing leadership education to students. Therefore, faculty members in these programs may be more familiar with the concepts and skills needed to become effective agricultural leaders. This familiarity may contribute to the rapid growth and development of agricultural leadership programs.

Evolution of the Discipline

Several respondents noted the growth of agricultural leadership programs has been influenced by a broader academic appeal and the need for leadership skills in the agricultural industry. This evolution has led to the development of new courses and programs dedicated to preparing students for leadership roles in the agricultural sector.

Recommendations for Future Growth

Faculty members expressed a desire for collective collaboration among programs and departments. They emphasized the importance of creating a strong identity and a unified vision for the agricultural leadership discipline. The development of experiential and service-learning opportunities was also highlighted as a critical component for future growth.

Outlook of Ag Leadership Education

Faculty respondents generally agreed that agricultural leadership programs will continue to grow and evolve in the future. This outlook is driven by the increasing demand for leaders in the agricultural sector and the need for well-prepared professionals to address the challenges facing the industry.

Relevancy of Agricultural Leadership Programs in Academia

Faculty respondents highlighted the importance of creating leaders through human capital. They discussed the need for political, policy, and public influence to ensure that agricultural leadership programs are relevant and responsive to the needs of the agricultural sector.

In conclusion, agricultural leadership programs have experienced significant growth in recent years. This growth can be attributed to a direct connection to agricultural and extension education, the need for leadership skills in the agricultural industry, and the evolution of the discipline. The future outlook for these programs is promising, with faculty members expressing a desire for continued growth through collective collaboration, the development of experiential opportunities, and the focus on creating leaders through human capital and political influence.
F17) discussed agricultural leadership as a discipline created on the “coat tails” of agricultural and extension education when senior faculty members identified a need to better train teacher educators and extension agents for their respective fields. Respondent F17 said, “As a land-grant university, obviously, we are a supply stream of extension agents, so the degree was created…” Further echoing that sentiment, respondent F15 indicated agricultural leadership, at her institution, was promoted to students who were studying in teacher preparatory programs, but later decided they didn’t want to teach secondary agricultural education.

A second major theme (F1, F3, F8, F10, F13, F18) revealed agricultural leadership saw implementation and growth because of increasing demands from agricultural industry professionals. They expressed the need for graduates to possess a more diverse set of “soft” skills such as leadership, communication, organization and development. F18 suggested graduates lacked a set of structured soft skills or understanding of leadership and personal development. “Overall, agricultural leadership was created here at [my university] because the feedback we got over and over again indicated our graduates were technically competent, but really needed those skills on how to work with others and step up as a leader.” Furthermore, the development of some agricultural leadership programs was the direct result of industry leaders approaching college administrators to express the need for curricula in leadership development.

The agricultural industry leaders from across [my state] came to the dean of the College of Agriculture and Life Sciences here at [my university], and specifically told him that [my university] was doing an exceptional job of teaching content matter to our graduates; however, industry research found a need for students to have more 21st century leadership type skills (F8).

Evolution of a Discipline

Since the creation of the discipline of agricultural leadership, respondents cited the need to establish competencies and an overarching purpose for the discipline.

A majority (n=10) of faculty respondents indicated agricultural leadership has evolved in terms of maturity, definition and growth. The respondents (F1, F4, F7, F8, F9, F10, F12, F13, F14, F15) articulated how agricultural leadership has matured in a broad sense by reinforcing skills from other areas of agriculture. These faculty respondents noted that agricultural leadership curriculum not only promotes leadership education, but also the necessity of learning other skills such as communications, economics, and agricultural policy.

Additionally, respondents F4, F9 and F14 spoke of agricultural leadership serving as something similar to what was once a general agriculture degree at many universities. For example, F9 said, “Agricultural leadership is great for the student who knows exactly what they want to do, or also great for those who have no idea about what they want to do.” Moreover, agricultural leadership programs are appealing to students from a variety of disciplinary areas (F14). For example, a leadership minor pairs well with a degree in business, education, or even engineering as it allows students to further develop soft skills to succeed in their given profession.

Respondents F2, F5, F6 and F17 articulated the need for consistency in curriculum nationwide. For example, core courses required of agricultural leadership programs should be similar. This could include courses pertaining to personal leadership development, leadership theory, ethics, and team and organizational leadership. While curriculum among programs still varies, there has been a shift among programs to offer a more standardized curriculum. “There is more structure [in agricultural leadership, nationally] than there was 10 years ago, 15 years ago, or...
25 years ago. What I am talking about is a sense of organization to what agricultural leadership actually is” (F2). The movement towards a more standardized approach to agricultural leadership can be evidenced by the creation of the National Leadership Education Research Agenda (NLERA) (F5). The NLERA has not only established target research areas for leadership education but promoted collaboration among agricultural leadership faculty (F5).

**Recommendations for Growth**

Two main themes were determined regarding question three soliciting recommendations for future growth and improvement. These themes centered on 1) collaboration with faculty across the discipline and 2) a lack of future vision and purpose for the discipline.

Regarding collaboration, 10 faculty respondents (F1, F2, F4, F5, F6, F7, F9, F14, F15, F17) referenced the need for more collaboration among faculty members across the country to create cohesiveness throughout the discipline, share ideas for teaching and research, and to promote and publicize the importance of agricultural leadership. One individual (F5) suggested collaborating outside the discipline to better understand the concepts, ideas and structures that work alongside agriculture. Specifically, respondent F5 gave an in-depth answer regarding the importance of this issue.

If we don’t look at the varying systems that interact with agriculture such as nutrition, climate change, energy consumption, etc., we cannot be effective. The biggest thing we can do for our discipline, and especially our world, is to collaborate with other disciplines because leadership in itself is an interdisciplinary discipline (F5).

Respondents advocated the need for a professional “home” organization, where agricultural leadership educators could meet to discuss ideas and promote their agenda (F2, F7, F9, and F15).

There’s no single place [organization] that has risen to bring people who do agricultural leadership and agricultural leadership education together. I think about things like AAAE (American Association for Agricultural Education), and I don’t think these organizations serve agricultural leadership folks the way it could because it focuses on agricultural education. All of the professional organizations in agricultural communications might serve us, but they aren’t (F2).

Respondent F9 indicated “agricultural leadership faculty members exist on their own due to the lack of a designated professional organization. There’s not a driving force to do professional development, and everyone has to seek their own opportunities.” Another respondent (F15) talked about the need to create dialogue to share ideas, stories, and experiences. “Having this [platform] would help our discipline so much. I don’t think we have a great platform to do that because not everyone goes to ALE or AAAE, so we [agricultural leadership] don’t really have a place where we can gather as educators…” (F15). Additionally, F2 and F7 made comments about the Association of Leadership Educators (ALE) potentially filling this void. However, both respondents felt ALE had a broad leadership focus instead of a specific focus on agricultural leadership. Moreover, four respondents (F2, F7, F9, and F15) stressed the importance of identifying a professional development home for the agricultural leadership discipline.

Another theme regarding recommendations for future growth and development emerged. Eight faculty members (F1, F2, F4, F5, F6, F14, F15, F17) discussed the importance of creating a
set of standardized key elements that should be present in agricultural leadership programs in terms of course work, curriculum, theory, research and hands-on learning. For example, one respondent (F4) discussed how his institution created a task force to define key elements critical to the success of an agricultural leadership program. The ending result was the evolution of seven program competencies, including leadership and motivation theory, communication skills, change management, conflict management and resolution, team and collaborative leadership development, policy formation, and service/experiential learning opportunities (F4). Other respondents (F1, F4, F6, F9, F12 and F15) talked about components present in their agricultural leadership programs, including capstone courses, internships, international opportunities, research experiences, and service learning opportunities.

Future Outlook

Additionally, the study examined why faculty believe agricultural leadership-related programs are relevant by also analyzing their outlooks for the future of the discipline. Several themes related to sustainability through collaboration and connectedness among professionals, implementation of clear, standardized competencies to be disseminated to students through coursework, and finally, a much larger presence of experiential learning opportunities.

Faculty members’ opinions varied significantly in how the discipline would grow, but the majority (F1, F2, F3, F5, F6, F7, F8, F12, F13, F14, F15, F16 and F17) believed agricultural leadership would grow in some capacity. For example, faculty members F7, F13, F14 and F17 each indicated agricultural leadership will experience an influx of students at institutions because of an increased awareness from industry professionals regarding the validity of agricultural leadership. “It [agricultural leadership] allows students within the college [of agriculture] or outside the college to take classes to help develop their leadership skills” (F1). Moreover, respondents cited students recognizing the value of obtaining skills learned in an agricultural leadership program.

I talk to a lot of perspective students who are passionate about the industry and recognize a need to better communicate and educate the population about the importance of the agricultural industry. I think with that taking place, the agricultural leadership major is a great place to really capture that enthusiasm and build that skill set to accomplish the goals being set forth by industry (F13).

Additionally, an influx of student enrollment in agricultural leadership courses could foster the creation of new agricultural leadership faculty positions. “As you look at the jobs that are opening up across institutions nationwide, often times, they’re in leadership, and I think that it will just continue to grow as people see our graduates making huge impacts in the industry by bringing new skills to the table that they’ve learned in our classroom” (F7).

Relevancy of Agricultural Leadership

The most notable theme expressed among faculty members related to relevancy of agricultural leadership programming (F3, F4, F5, F7, F12, F13, F17) was the idea of creating leaders within communities and rural settings and the agricultural industry. Specifically, F3, F4 and F5 discussed the necessity of agricultural leaders being useful in the political arena by working to influence lawmakers and agency officials to favor agricultural issues. Mimicking those feelings were faculty members F7, F12, F13 and F17, who articulated that agriculture leaders are well-versed about agricultural issues, and having the ability to educate the general public about circumstances and issues facing the industry. “We’ve got to have those people at the forefront who are well-versed on how to get a group of people moved toward a common goal” (F7).
A number of faculty members attributed the relevancy of agricultural leadership to its students and graduates serving as high-quality leaders. This is because of the ability of agricultural leadership programs to harness “human capital in modern organizations” (F2). Respondents F2, F10 and F15 described the development of human capital through the wide variety of programming areas that takes place in agricultural leadership academic programs. Respondent F15 explained a study recently conducted by the American Association of Universities said “most employers are struggling because the students they’re wanting to hire don’t have soft skills such as critical thinking, communications and leadership, and we’ve been doing that all along.” Further solidifying F15’s statements were F2 and F10, when they reported agricultural leadership remains relevant and sustainable by developing leadership capacities in students with personal development, team development and organizational development competencies.

A final theme related to agricultural leadership’s relevancy was shared by faculty members F1, F8, F9 and F16, who described a broad academic area with the unique ability to appeal to a wide variety of individuals. F16 indicated agricultural leadership ties together scholarship with leadership and citizenship skills to cultivate credentialed programming students enjoy. Additionally, agricultural leadership equips students to succeed in the real world.

I think it [agricultural leadership] is really a wide variety of 21st century skills in being able to collaborate, communicate, critically think and creatively think that our whole industry needs. Any industry is going to teach you exactly what you need to know once you are hired, but I think those four C’s I mentioned are what employers are looking for. If you can elaborate on those and effectively communicate your skillset and what you offer to that company, our students will always be in demand, continue to get good paying jobs, and advance up the corporate ladder in the professional world (F8).

F1 echoes the statement by suggesting agricultural knowledge, coupled with leadership skills and knowledge, helps the discipline to grow because of the wide skill set that is applicable in any student’s “toolbox.” Making a final case for this theme was faculty member F9, who stated “we won’t prepare you [student] narrowly in one area, but we will prepare you [student] more broadly in multiple areas, so they [students] don’t have trouble finding jobs because they’re prepared for a number of areas.”

Conclusions and Recommendations

The study sought to gain perspective for future recommendations from leaders within the agricultural leadership discipline. A thorough web search of 1862 land-grant institutions identified 26 institutions with leadership programs hosted in colleges of agriculture, food, life, human or environmental sciences. Interviews were conducted with 19 respondents, including 14 males and 5 females. Respondents were mostly faculty members and included 7 professors, 3 associate professors, 8 assistant professors, and one instructor.

Conclusions and Recommendations for Objectives 1 and 2

The need for the development of agricultural leadership programs appears to have been driven by a demand in industry for graduates with stronger leadership and “soft” skills. While some respondents compared their agricultural leadership programs to a general agricultural degree, further evolution of the discipline away from being simply a general agriculture degree, was, according to respondents, driven by industry demands, as employers complained that students had content knowledge but were lacking in soft skills (Morgan, et al., 2013). Therefore, the importance
of students developing leadership skills has been highlighted to agricultural leadership faculty by the demands of industry (Valez, et al., 2013). Agricultural leadership programs are able to fill this industry need by cultivating a skilled and knowledgeable agricultural workforce that also possesses desired soft skills such as leadership, communication, and organizational and team development skills.

The evolution of the discipline was clearly described by faculty respondents as being strongly connected to the disciplines of agricultural education and extension education. Originally, the discipline served as a program for agricultural education students who did not want to teach secondary agricultural education or become extension educators but rather wanted to go into other agricultural professions.

These two conclusions are supported by Ajzen’s Theory of Planned Behavior in a number of ways. TPB is used to predict and explain behaviors and actions based on an individual’s beliefs regarding a certain situation. Behavioral beliefs, which focus on likely outcomes related to a person’s influence under motivational factors for him or her to perform a certain behavior, can be linked to industry needs for agricultural leadership education. For example, when industry leaders instructed institutions to better prepare students with “soft” skills, the support of industry leaders indicated a higher probability of establishing a successful program as a result of industry support, so academia worked to create new programming. This is a solid example of behavioral beliefs affecting faculty and administrators’ intentions and behaviors.

Furthermore, many respondents who were engaged in agricultural leadership education had a background in or knowledge of agricultural and extension education programs, such as 4-H or FFA. These results coincided with the TPB concept of normative beliefs, which indicated people are more likely to perform a certain behavior if it is promoted by an action that is part of one’s social norm. As faculty expressed detailed knowledge of agricultural leadership programming, their behaviors could be described as “socially normal” because other faculty work to advocate for and improve common areas across the discipline.

Members of the discipline certainly claim their agricultural education and extension education roots and are motivated by industry’s demand for their students. These concepts should be embraced by the discipline as strengths and as part of the foundation of the discipline.

Conclusions and Recommendations for Objective 3

Faculty members’ opinions of how the curriculum, programs, and the discipline should change and grow were also very clear. Since the creation of the discipline, few efforts to establish disciplinary standards and competencies have been made. Yet, faculty opinions indicate that agricultural leadership programs lack consistency in curriculum, skill sets, and research focus from one institution to another. This could be a result of a lack of efforts to establish cohesiveness and foster collaboration among agricultural leadership faculty. Many respondents cited the lack of a professional home organization for the discipline.

Similar results were indicated by a study conducted by Valez, McKim, Moore, and Stephens (2015) which found agricultural leadership faculty felt they had only minimal to moderate support from AAEE in regard to professional development and research endeavors. Moreover, respondents cited ALE as a professional organization with an emphasis in leadership but cited the organization did not completely fulfill the needs of agricultural leadership educators. One way to promote professional development opportunities for teaching and research is to establish pre/post-
conference sessions specifically dedicated to agricultural leadership education at major meetings of organizations such as NACTA, AAAE, ILA, or ALE.

The lack of a professional development organization dedicated to agricultural leadership could contribute to the absence of consistency in curricula among agricultural leadership programs. Currently, there are not established key competencies for agricultural leadership programs. The development of key competencies would impact courses offered, experiential learning opportunities, and theories infused into the curriculum. Respondents cited a need for opportunities to collaborate on curriculum development, course work, and research opportunities to create cohesiveness throughout the discipline. Establishing consistency among programs is important as agricultural leadership faculty are working to educate future leaders within the agricultural industry (Velez, et al., 2014).

The findings of this study also revealed that respondents expect the agricultural leadership discipline to continue to grow in course offerings, student numbers, graduate programs, and creation of faculty positions. This predicted growth of agricultural leadership programs could be related to industry demand for a skilled, educated workforce that possesses soft skills (Morgan, et al., 2013). Growth in student numbers could also be related to the interdisciplinary nature of agricultural leadership programs where majors, minor, concentrations, certificates and specializations pair well with other programs such as business, education, and engineering. However, the discipline should move forward cautiously, because growing too quickly without an overarching vision and plan for continued growth could be detrimental. Ensuring that the discipline retains its faculty, infrastructure, and professional development support needed to remain viable within academia is paramount (Velez, et al., 2015).

Theoretical ties for recommendations to the discipline can be linked to several components of Bloom’s Taxonomy, which, at its core, is used to promote higher levels of learning in education. First, the understand component of Bloom’s Taxonomy aligns with recommendations from faculty who addressed issues in the discipline, such as a lack of professional home or benchmarks for evaluation. Understanding promotes the explanation of ideas or concepts such as recognition, identification, discussion, and classification. In order for development to take place among nationwide programs, academic professionals must first understand the issues at hand.

Another specific element of Bloom’s Taxonomy that can be identified in the results is create. The creation element of the model highlights the production of new work through investigation, design, construction, and development. Reaching the top level of Bloom’s was achieved through respondent recommendations regarding the creation of standardized “benchmarks” to measure varying aspects of the discipline. By designing and creating benchmarks to measure discipline standards for growth, success, education, and advancement, agricultural leadership meets the highest level of measurement for educational objectives and outcomes (Krathwohl, 2002).

Based on the conclusions of this study, a further recommendation that seems evident is for the discipline to work toward adding professional diversity to its membership. Specifically, it is interesting to note there were few (n=3) respondents with the rank of associate professor. Instead respondents were either assistant professors (n = 8) or professors (n=7). Additionally, respondents were predominately male (n = 14) with only five female respondents in the study. A study analyzing the demographics of agricultural leadership faculty should be conducted to further describe the professional makeup of the discipline.
The nationwide growth witnessed in agricultural leadership programs has been evident for a number of years (Schwartz, Axtman, & Freeman, 1998). Growth and distribution related to programs at 1862 land-grant institutions has been fairly concentrated to one geographic area. Results of this study revealed 15 agricultural leadership programs are located east of the Mississippi River, whereas 11 programs are located to the west. While this may appear relatively even, it’s interesting to note of those 15 programs located in the eastern half of the country, 10 schools (38%) are located in the southern region of AAAE. Future research might be conducted in eastern or western regions of the United States to determine if students in certain areas of the country without agricultural leadership education programs might be deficient in leadership related “soft” skills, as opposed to areas where programs are more prevalent.

Another interesting piece of research might analyze the national chasm in agricultural leadership programs regarding the placement of programs in regions where agricultural production remains more prevalent, as opposed to urbanized areas where production agriculture is nearly non-existent. A comparison of agricultural leadership competencies among industry professionals in the southern United States against industry professionals in the northeast section of the country might better explain any dichotomy in regional leadership skills and proficiencies.

While this study focuses on faculty perceptions about the discipline, future studies should be conducted to determine student perceptions, present and past, of agricultural leadership programs. Specific exploration should focus on key concepts and skills learned through course work, perceived levels of faculty preparation, experiential learning opportunities, and job placement post-graduation. A student-focused study would assist faculty by identifying specific areas of improvement needed within the discipline while providing insight to student needs.

Recommendations also include analyzing each program’s course structure to understand if programs are more agriculturally focused with a leadership component or leadership focused with agricultural components. As one faculty member stated, professionals in the field must answer the question “what is agricultural about agricultural leadership?” Perhaps research would better answer that question. If agricultural leadership education is to be successful long-term, future research should be conducted to expand on this study, perhaps go beyond the confines of 1862 land-grant institutions, to better grasp the entire structure and outlook of agricultural leadership programs across the nation.

Conducting research in the previously-mentioned areas might further the understanding of agricultural leadership programs aligning with general agricultural degrees. This supports previous recommendations given by Mannebach (1990) and Spotanski and Carter (1993), who said research in agricultural leadership should cast a wide net to encompass a multitude of programs to better understand research priorities focused in teaching, research, training, student development, program size and structure, and programmatic growth. Graham (2001) recommended the spectrum of agricultural leadership education should accommodate new environments and situations to best ensure survival by promoting all aspects of the field.

Finally, as the discipline continues to grow, leaders within the discipline should work to establish a professional development organization dedicated to agricultural leadership. The need for organized professional development opportunities for agricultural leadership faculty is growing (Velez, et al., 2015), and this sentiment was definitely present among the faculty respondents in this study. A professional development organization could work to establish key program competencies, foster opportunities for sharing ideas, create collaboration efforts to improve research, and develop faculty partnerships to collaborate on grants. Additionally, the creation of
such organization would provide agricultural leadership faculty with professional development needed to ensure high quality leadership programs.

References


Encouraging Engagement in Water Conservation: Can Trust from Extension Create Change?

Brandon H. McKee¹, Alexa J. Lamm², & J. C. Bunch³

Abstract

Extension educators seek to provide scientific research and perspective to farmers and the public. The connection that Extension educators foster between farmers and consumers can be capitalized upon to build trust and ultimately encourage behavior change through social capital. Agricultural educators have recognized the need for consumers and farmers to develop trust and mutuality in order to combat complex issues such as water usage. Agriculture is the greatest user of water in the United States; therefore efforts to encourage agricultural water conservation have been explored. Unfortunately, they are largely unsuccessful because of the increased production cost associated with conservation passed on to consumers. This study explored how U.S. consumers’ related their willingness to pay for products conserving water with their level of trust that farmers are good conservationists. The findings revealed that trust that farmers will conserve water is predicted by the degree of positive and negative relationships that consumers identify. The findings imply that by developing relationships between consumers’ trust and their willingness to pay, Extension educators can encourage engagement in agricultural water conservation practices.

Keywords: Extension, trust, social capital, public perception, water conservation

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Introduction

Extensive educational programs are provided by Extension educators and promoted through collaborative efforts made between the local, state, and federal government (Terry & Osborne, 2015). Extension educators strive to provide the public with quality research to assist in developing informed decisions on critical issues at all levels. The types of relationships Extension educators create between the public and the agricultural, food, fiber, and natural resource industries are significant to combatting the fragmented communication between the groups (Duffy, Fearne, & Healing, 2005). In order to be successful in this endeavor, mutual trust must exist between leaders, followers, consumers, and farmers alike (Mwangi, 1998). These integral relationships develop social capital, which can be used to address complex environmental issues, and has shown to be an underappreciated tool for conservation (Pretty & Ward, 2001).

As well, we know water scarcity is an ever-growing global issue that must be addressed directly and thoughtfully. While water may encompass 66% of the Earth’s surface, freshwater

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makes up only 2.5% of which 69% of the freshwater is captured in the polar ice caps (Engelman et al., 1993). Of the small percentage of freshwater that is available for use, 8% is used in households and 23% is used by industry; leaving agriculture as the greatest drain on the water supply (69%; Engelman et al., 1993). Further, water extraction for domestic, food, and industrial uses has had a major impact on ecosystems and this affect will only be exacerbated by the growing demand for water (Rijsberman, 2006). While many believe the issue of water scarcity will create international conflicts, it has been recognized that the larger risks are the conflicts within countries (Ohlsson, 2000). These conflicts will stem from the institutional changes required to adapt to water scarcity (Ohlsson, 2000). Additionally, consumers are sensitive and resistant to higher water prices (Olmstead & Stavins, 2009). However, a possible solution to water scarcity is reducing demand of water by changing consumer preferences for water use (“Shift in Demand Curve: When Price Doesn’t Matter”, n.d.). Consumer preferences can be reformed through educational programs, such as those Extension provides. In addition, the literature is clear that Extension educators must address the complex issue of water scarcity in the near future if it wants to remain relevant (Huang & Lamm, 2015a; Huang & Lamm, 2015b; Huang, Lamm & Dukes, 2016; Lamm, Lamm, & Carter, 2015).

Non-formal education can be defined as “any intentional and systematic education enterprise in which content is adapted to the unique needs of the students in order to maximize learning” (as cited in Etling, 1993, p.73). The connection Extension educators build between consumers and the farmer is typically through non-formal education programs and can be used as effective avenues for creating trust between the parties (“Extension”, n.d.). Non-formal education creates collective actions and experiences that work to meet needs and solve issues (Kindervatter, 1979). Users of non-formal education programs have developed improvements to social, economic, and political standings. Thus, by understanding the function of Extension and how Extension educates the public, initiatives can be taken to develop desirable traits within the consumers.

According to Rogers, Silva, and Bhatia (2001), water is an economic good and the way to promote equity, efficiency, and sustainability of water is addressed conceptually through water pricing. However, Martinez-Espineira and Nauges (2006) identified water consumption as an elastic and inelastic good, making the issue of water conservation more difficult to regulate. While water pricing alone is not a valid means of encouraging water conservation, it can be used in conjunction with consumer trust to resolve water scarcity (Yang, Zhang, & Zehnder, 2003). The greatest issue facing agricultural water conservation is the cost of water efficient technologies. The high entry cost of water conservation technology discourages many farmers from participating because of a reduction in profitability (Seo, Segarra, Mitchell, & Leatham, 2007). Seo et al. (2007) stated that in order to save water, current farmers need to be convinced to replace old irrigation systems with new ones (2007). The cost of innovation will be reliant upon consumers’ willingness to pay for conservation practices. This study focuses on encouraging farmers to implement water-conserving practices by better understanding why consumers are more or less willing to pay for the cost of these practices.

Many studies have tested the validity of increasing water prices to encourage water conservation and the findings have shown hesitation and dissatisfaction among consumers and farmers (Olmstead & Stavins, 2009; Seo et al., 2007; Yang et al., 2003). While farmers may be hesitant to switch to water efficient practices (Seo et al., 2007), they can find solace in consumer support that will allow for higher prices for the sake of water conservation. Extension, as a non-formal education program, can be used as an effective tool for trust development between the two groups (“Extension”, n.d.) serving as a natural bridge between farmers and consumers (Duffy et al., 2005). Ultimately, this study sought to address two priorities from the national research agenda for agricultural education (Roberts, Harder, & Brashears, 2016). Those priorities include “public
and policy maker understanding of agriculture and natural resources” (p. 13) and “addressing complex problems” (p. 57).

**Theoretical Framework**

This study utilized social capital theory (Lin, 2001) as a means of identifying solutions to the growing concern of water scarcity. Social capital theory illustrates the notion that an investment in social relations will bring an expected return in the marketplace (Lin, 2001). Lin (2001) explained there are four main ways social capital brings about change, including (a) the reduction of transaction costs and stronger rewards, (b) the exertion of influence on agents, (c) the accreditation of actors, and (d) the reinforcement of identity and recognition (Lin, 2001). While consumers are hesitant to accept increasing water prices (Olmstead & Stavins, 2009; Seo et al., 2007; Yang et al., 2003), they could be more inclined to pay for water conservation practices if they have developed social capital with farmers.

Several studies have used social capital theory to investigate different phenomenon within the agricultural and natural resource realm. Cramb (2005) found significant support for the concept that social relations and ties could encourage soil conservation (Cramb, 2005). The study focused on the establishment of a Landcare Program. The Landcare groups were composed of farmers and community members alike and were used to construct bridges of social capital to identify and improve issues regarding soil conservation. The study concluded that the success of the Landcare groups did not lie within the multitude of farmer trainings, cross-farm visits, or information sessions, but in the community social ties that were developed and the creation of social capital (Cramb, 2005).

A study that examined citizens’ perception of water conservation policies, and the influence of social capital on these perceptions, concluded that where social capital was low, citizens perceived the price of water as high (Jones, Evangelinos, Gaganis, & Polyzou, 2011). Social trust was found to be a noteworthy factor when determining the perception of costs to consumers. In addition, an increase in social collaboration was found to be an explanatory variable in perceived low costs and also created policy support. While water consumption policies are often observed as ineffective measures toward conservation, the policies can gain traction through social capital, which can be used as a tool for confronting issues. This study recommended that if prior to policy implementation there was a social capital assessment than many ineffective elements in the policy could be addressed (Jones et al., 2011).

Another study addressed how source credibility affected attitude formation and perceptions of the public regarding agricultural water use (Lamm, Owens, Telg, & Lamm, 2016). The study showed four identical videos of a speaker explaining how farmers can use best management practices to reduce water consumption; the only differing factor was the source treatment given to each video. The study revealed the public was generally open to agriculture taking the necessary water conservation steps, regardless of increased food prices. In fact, when the source treatment was a farmer, which was deemed as more trustworthy, there was a statistically significant higher score associated with the impacts farms have on the environment. Lamm et al. (2016) accredited this to the farmer being an individual with expertise in their domain but trust also played a significant role and needed to be explored further.

Social capital theory could provide a potential solution to water scarcity that is outside of the ineffective, redundant initiatives that have used public financial responsibility as a driver. While past efforts mentioned by Olmstead and Stavins (2009), Seo et al. (2007), and Yang et al. (2003) have shown to be feeble, social capital theory provides a new frame for this complex issue (Lin,
Encouraging Engagement in Water Conservation:... 

2001). Extension educators are an established group of professionals ready to address water issues by building social capital between farmers and consumers (Duffy et al., 2005).

Purpose and Objectives

The purpose of this study was to determine if the degree of trust consumers have in farmers being conservationists impacts consumers’ willingness to pay for water conservation. The following research objectives guided this study:

1. Describe consumers’ trust in farmers as conservationist.
2. Describe consumers’ perceptions of farmers being conservationists.
3. Describe consumers’ willingness to pay for water conservation.
4. Determine if consumers’ perceptions of farmers being conservationists predicts their trust in farmers.
5. Determine if consumers’ trust in farmers and their perceptions of farmers being conservationists predicts their willingness to pay.

Methodology

A survey distributed online was used to accomplish the research objectives. The survey was based upon the 2012 RBC Canadian Water Attitudes Study (Patterson, 2012) and the Government Style Questionnaire (Green-Demer, Blanchard, Pelletier, & Béland, 1994). While part of a larger study, four sets of questions were specifically used in this study to measure the following indices (a) perception of farmers as conservationists, (b) trust in farmers, and (c) willingness to pay for conservation practices. In order to uphold the survey’s integrity and validity, a panel of experts specializing in public opinion research, water issues, and survey design reviewed the survey prior to distribution. Panel members included the Director of the UF Water Institute, the Chief Executive Officer of Florida Nursery, Growers, and Landscape Association, an Extension specialist in water economics and policy, the Director of the UF/IFAS Center for Landscape Conservation and Ecology, the associate director of the UF/IFAS Center for Public Issues Education, and an assistant professor specializing in agricultural communication.

The target population of interest was US residents aged 18 or older. After expert panel review and revision, a pilot test was conducted with 50 respondents representing the target population to approve the validity of the constructs. The Cronbach alpha levels for each of the constructs were greater than .80 in the pilot study so they were deemed appropriate measures. Using a non-probability opt-in sampling technique, a survey research company distributed the finalized survey nationally. A total of 2,704 individuals were invited to complete the survey. Quotas for the study were established a priori to ensure the sample would be representative of the US population and attention filters were integrated. Respondents had to fill the required quota and pass the attention filters for their responses to be accepted as complete. The data collection methods utilized resulted in 1,050 complete surveys, equating to a 42% participation rate.

Recognizing the potential for selection, exclusion, and non-participation biases due to using a non-probability sampling method, a post-stratification weighting method was applied to ensure the analyzed data properly represented the population of interest (Baker et al., 2013; Kalton & Flores-Cervantes, 2003). Data was weighted using the 2010 US Census data ensuring residential state, age, gender, and race/ethnicity matched the national population.

Table 1
Demographics of Respondents \((N = 1,050)\)

<table>
<thead>
<tr>
<th>Category</th>
<th>(n)</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>538</td>
<td>51</td>
</tr>
<tr>
<td>Male</td>
<td>512</td>
<td>49</td>
</tr>
<tr>
<td><strong>Ethnicity</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>703</td>
<td>67</td>
</tr>
<tr>
<td>Black</td>
<td>122</td>
<td>12</td>
</tr>
<tr>
<td>Asian/Pacific Islander</td>
<td>52</td>
<td>5</td>
</tr>
<tr>
<td>Native American</td>
<td>7</td>
<td>1</td>
</tr>
<tr>
<td>Multiracial</td>
<td>15</td>
<td>1</td>
</tr>
<tr>
<td>Other</td>
<td>151</td>
<td>14</td>
</tr>
<tr>
<td><strong>Age</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20 - 39</td>
<td>370</td>
<td>35</td>
</tr>
<tr>
<td>40 - 59</td>
<td>383</td>
<td>37</td>
</tr>
<tr>
<td>60 or older</td>
<td>296</td>
<td>28</td>
</tr>
<tr>
<td><strong>Education Level</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Some high school</td>
<td>18</td>
<td>2</td>
</tr>
<tr>
<td>High School degree / GED</td>
<td>227</td>
<td>22</td>
</tr>
<tr>
<td>Some college</td>
<td>261</td>
<td>25</td>
</tr>
<tr>
<td>2-year degree</td>
<td>139</td>
<td>13</td>
</tr>
<tr>
<td>4-year degree</td>
<td>275</td>
<td>26</td>
</tr>
<tr>
<td>Graduate / Professional degree</td>
<td>130</td>
<td>13</td>
</tr>
<tr>
<td><strong>Political Affiliation</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Democrats</td>
<td>274</td>
<td>38</td>
</tr>
<tr>
<td>Republicans</td>
<td>400</td>
<td>26</td>
</tr>
<tr>
<td>Independents</td>
<td>266</td>
<td>25</td>
</tr>
<tr>
<td>Non-affiliated</td>
<td>104</td>
<td>10</td>
</tr>
<tr>
<td>Other</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td><strong>Income Level</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than $24,999</td>
<td>228</td>
<td>22</td>
</tr>
<tr>
<td>$25,000 - $49,999</td>
<td>300</td>
<td>29</td>
</tr>
<tr>
<td>$50,000 - $74,999</td>
<td>254</td>
<td>24</td>
</tr>
<tr>
<td>$75,000 - $149,999</td>
<td>223</td>
<td>21</td>
</tr>
<tr>
<td>More than $150,000</td>
<td>45</td>
<td>4</td>
</tr>
</tbody>
</table>
Respondents were asked to indicate their perception of farmers being and not being conservationists, their trust in farmers as conservationists, and their willingness to pay for conservation practices each on a five-point Likert-type scale. The scale had ranges including 1 = Strongly Disagree, 2 = Disagree, 3 = Neither agree nor disagree, 4 = Agree, or 5 = Strongly Agree. In addition, respondents were able to identify Does Not Apply. Does Not Apply responses were considered missing values for the study. The perception that farmers are/are not conservationists indices were both created with five questions, trust in farmers had three questions, and the willingness to pay construct had three questions. The indices were created by calculating the average of the scores that could range from one to five. Each of the indices had reliable Cronbach’s alpha coefficients with a .84 for farmers are conservationists, .86 for farmers are not conservationists, .74 for respondents’ trusting farmers as conservationists, and .84 for respondents’ willingness to pay for conservation practices. Lastly, respondents were asked to answer several questions based upon their demographics. Descriptive statistics were used to achieve the first three objectives and multiple linear regression was used for objectives four and five.

Results

Objective 1: Trust in Farmers as Conservationists

Respondents were asked to indicate their trust in farmers as conservationists using three statements (see Table 2). Most of the respondents’ agreed or strongly agreed farmers were concerned about water when they were making important decisions about farming (86%). Only 3.5% disagreed or strongly disagreed with the statement. The three statements were averaged to create the trust in farmers index (α = .74). The trust in farmers index had a mean of 3.83 (SD = .72).

Table 2

**Trust in Farmers**

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Neither Agree Nor Disagree</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>I know farmers will be concerned about water resources when they make</td>
<td>1019</td>
<td>.7</td>
<td>2.8</td>
<td>10.3</td>
<td>37.3</td>
</tr>
<tr>
<td>important decisions about farming</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sound principles seem to guide farmers’ behavior when it comes to water</td>
<td>998</td>
<td>1.7</td>
<td>6.8</td>
<td>29.1</td>
<td>44.5</td>
</tr>
<tr>
<td>use</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Farmers can be relied upon to keep their promises when it comes</td>
<td>989</td>
<td>2.7</td>
<td>10.6</td>
<td>35.8</td>
<td>35.7</td>
</tr>
<tr>
<td>to water use</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. N for each item varies based on the option to select does not apply that was coded as missing data.
Objective 2: Perceptions of Farmers being Conservationists

Respondents were asked to identify how well farmers conserve water by responding to ten statements. The first five statements were positive and written as farmers being conservationists (see Table 3). The last five questions were negative and written as farmers being non-conservationists (see Table 4).

Within the farmers being conservationist set, the statement that farming protects our natural environment was the one statement most strongly agreed upon (18.7%). However, the second statement that farm lands or privately owned agricultural lands allow water to return to and recharge groundwater resources had the highest amount of agreeance, a combination of agree and strongly agree percentages, with 60.2%. An index was created by taking the average of the five statements ($\theta = .84$). The mean score of the index was 3.50 ($SD = .77$).
Table 3

*Perceptions of Farmers as Conservationists*

<table>
<thead>
<tr>
<th>Perception</th>
<th>N</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Neither Agree Nor Disagree</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Farming protects our natural environment</td>
<td>1005</td>
<td>2.3</td>
<td>9.2</td>
<td>29.3</td>
<td>40.5</td>
<td>18.7</td>
</tr>
<tr>
<td>Farm lands or privately owned agricultural lands allow water to return to and recharge groundwater resources</td>
<td>911</td>
<td>1.4</td>
<td>5.6</td>
<td>32.8</td>
<td>41.7</td>
<td>18.5</td>
</tr>
<tr>
<td>Farmers only use as much fertilizer as necessary on their fields and crops</td>
<td>957</td>
<td>5.6</td>
<td>12.4</td>
<td>38.0</td>
<td>29.1</td>
<td>14.9</td>
</tr>
<tr>
<td>Farmers only use as much pesticides as necessary on their fields and crops</td>
<td>953</td>
<td>6.1</td>
<td>14.2</td>
<td>35.1</td>
<td>30.9</td>
<td>13.7</td>
</tr>
<tr>
<td>Farmers conserve water</td>
<td>967</td>
<td>2.6</td>
<td>10.7</td>
<td>40.2</td>
<td>34.2</td>
<td>12.2</td>
</tr>
</tbody>
</table>

Note. *N* for each item varies based on the option to select does not apply that was coded as missing data.

When asked to respond to negatively framed statements that imply farmers are not conservationists, the majority of respondents indicated they believed farmers use pesticides on farms that pollute natural water sources. Only 8% disagreed or strongly disagreed with the statement (see Table 4). The farmers are not conservationists index was created by taking the average of the five statements (*α* = .86). The mean of the index was 3.49 (*SD* = .79).
Table 4

Perceptions of Farmers as not Conservationists

<table>
<thead>
<tr>
<th></th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Neither Agree Nor Disagree</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pesticides used on farms pollute natural water sources</td>
<td>994</td>
<td>2.1</td>
<td>5.7</td>
<td>23.5</td>
<td>41.4</td>
</tr>
<tr>
<td>Fertilizers used on farms pollute natural water sources</td>
<td>982</td>
<td>2.5</td>
<td>7.1</td>
<td>29.0</td>
<td>37.7</td>
</tr>
<tr>
<td>Animal waste produced on farms pollutes natural water sources</td>
<td>979</td>
<td>3.1</td>
<td>12.5</td>
<td>30.3</td>
<td>32.9</td>
</tr>
<tr>
<td>Farming causes water runoff</td>
<td>947</td>
<td>3.9</td>
<td>15.6</td>
<td>36.3</td>
<td>35.9</td>
</tr>
<tr>
<td>Farming causes soil erosion</td>
<td>942</td>
<td>4.8</td>
<td>23.8</td>
<td>33.8</td>
<td>29.7</td>
</tr>
</tbody>
</table>

Note. N for each item varies based on the option to select does not apply that was coded as missing data.

Objective 3: Willingness to Pay for Conservation

Respondents most strongly agreed with the statement that farmers should use fewer pesticides even if the consumer would have to pay more for food. Thirty-nine percent of the respondents strongly agreed with the statement and only 3% strongly disagreed with paying more for food in order for farmers to use fewer pesticides in production (see Table 5). The willingness to pay index was the average of the responses to the three statements (\( \bar{x} = .84 \)) and had a mean of 3.82 (\( SD = .92 \)).
Table 5

Willingness to Pay for Conservation

<table>
<thead>
<tr>
<th></th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Neither Agree Nor Disagree</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>1024</td>
<td>2.8</td>
<td>6.3</td>
<td>22.0</td>
<td>29.7</td>
</tr>
<tr>
<td>Farmers should use as little pesticides as absolutely necessary even if it means I have to pay more for the food I purchase</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>1024</td>
<td>3.1</td>
<td>8.1</td>
<td>28.0</td>
<td>29.9</td>
</tr>
<tr>
<td>Farmers should use as little fertilizer as absolutely necessary even if it means I have to pay more for the food I purchase</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>1023</td>
<td>3.3</td>
<td>7.0</td>
<td>30.6</td>
<td>31.6</td>
</tr>
<tr>
<td>Farmers should save as much water as possible when irrigating crops even if it means I have to pay more for the food I purchase</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. N for each item varies based on the option to select does not apply that was coded as missing data.

Objective 4: Predicting Trust in Farmers

A linear regression model was used to determine if perceptions (both positive and negative) of farmers as conservationists could predict trust. The farmers are conservationists construct was a significant predictor of consumers’ trust ($b = .63, p = .00$). The farmers are not conservationists construct was not a significant predictor. The model explained 40% of the variance in trust (see Table 6).

Table 6

Predicting Trust in Farmers as Conservationists

<table>
<thead>
<tr>
<th>Variable</th>
<th>Trust</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$b$</td>
</tr>
<tr>
<td>Farmers are conservationists</td>
<td>.63</td>
</tr>
<tr>
<td>Farmers are not conservationists</td>
<td>-.01</td>
</tr>
</tbody>
</table>

Note. $R^2 = .40$. 
Objective 5: Trust in Farmers and their Willingness to Pay

Trust in farmers \( (b = .22, p = .00) \) and farmers are not conservationists \( (b = .41, p = .00) \) were significant predictors of willingness to pay. The belief that farmers are conservationists was not a significant predictor. Twenty-one percent of the variance in consumers’ willingness to pay was attributed to these predictors.

Table 7

Predicting Willingness to Pay

<table>
<thead>
<tr>
<th>Variable</th>
<th>( b )</th>
<th>( p )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Farmers are not conservationists</td>
<td>.41</td>
<td>.00</td>
</tr>
<tr>
<td>Trust in farmers</td>
<td>.22</td>
<td>.00</td>
</tr>
<tr>
<td>Farmers are conservationists</td>
<td>.05</td>
<td>.20</td>
</tr>
</tbody>
</table>

Note. \( R^2 = .21 \).

Conclusion and Implications

Previous literature by Pretty and Ward (2001) may have identified social capital as a forgotten tool for conservation, but this study identified increasing social capital as an effective avenue for engaging the public in water conservation. These key findings revealed consumers’ trust and willingness to pay could be predicted by their respective constructs. Forty percent of the variance in respondents’ trust in farmers as conservationists can be determined by knowing the respondents perception of farmers as conservationists. In addition, an increase in consumers’ perception of farmers as conservationists was found to result in an increase in consumers’ trust.

Consumers’ willingness to pay for conservation practices can also be determined through significant predictors such as consumers’ trust in farmers and the belief that farmers are not conservationists. Therefore consumers were more likely to be open to paying for conservation practices if they trusted farmers as conservationists, as well as if they identified farmers as poor conservationists. This study indicated the more consumers know about farming practices, the more likely they are going to be willing to pay for stronger conservation practices, regardless if the farmer was perceived to be a poor or a strong conservationists of water resources.

The social capital ideology that social relations will bring an expected return in the marketplace (Lin, 2001) is supported by this study where the key findings reflected an increased willingness to pay from consumers despite perception of farmers. A poor perception on farmers as conservationists would create a natural assumption that consumers are unwilling to pay for increases in food. However, this study found that a growing negative perception of farmers as conservationists positively incentivizes consumers to pay more for food in turn for seeing stronger conservation practices. Previous research conducted by Lamm et al. (2016) supported the notion that the public is in favor of agriculture increasing conservation efforts, despite increasing food prices. Further, Lin (2001) described the main ways that social capital creates change should be considered. Lin stated that upon developing social capital, agents of change may begin experiencing
influence. Agents of change, such as Extension educators, can develop social capital with consumers by exerting influence on consumers’ spending habits.

Farmers may be hesitant to switch to water efficient practices because of high start-up costs, but they may be convinced to update practices with the right incentives (Seo et al., 2007). Likewise consumers are unlikely to change their water consumption due to water pricing alone (Yang et al., 2003) because of water’s complex elasticity model (Martinez-Espineira et al., 2006). Prior literature agreed with the results from this study, implying the influence of social capital on willingness to pay. Studies conducted by Jones et al. (2011) and Hoyman, McCall, Paarlberg, & Brennan (2016) supported social capital as an avenue for developing economic shifts in consumption of resources. This study supported the creation of social capital as an effective method of encouraging water conservation.

The findings imply Extension educators can foster consumers’ willingness to pay by developing mutual trust between respondents and farmers (Mwangi, 1998). Non-formal education develops social relations between parties, which can be used to solve problems (Kindervatter, 1979). ion educators’ ability to share information and build connections can serve as an invaluable asset for increasing consumers’ willingness to pay for conservation practices. As consumers are taught about agricultural water practices their perception of farmers being or not being conservationists will change (see Table 8). Regardless, if their views on farmers’ conservation practices are positive, consumers’ willingness to pay will increase.

**Recommendations**

Water consumption will only grow and be exacerbated in the future due to the increasing population (Rijsberman, 2006). Conflict both internationally and domestically are sure to arise (Ohlsson, 2000), therefore agriculture, as the number one user of freshwater, must be proactive in conservation efforts. However the cost of implementing water conservation practices is a natural deterrent for farmers, therefore the need for incentives and support of farming efforts is key to creating change. Extension clearly has a role to play in creating support for farmers through collaborations with consumers and farmers (Duffy et al., 2005). Based on the results of this study, it is evident that social capital is created through consumers’ trust in farmers and their perceptions of farmers as conservationists.

Extension educators should work with consumers and farmers to create mutual trust and understanding (Mwangi, 1998). For example, Extension educators creating a water-care program, such as the Landcare program, would encourage water conservation through an increase in social relations (Cramb, 2005). While a water-care program would be an effective avenue for sharing information and for trainings, Cramb (2005) found these to be of less importance when compared to the real catalyst of change, social capital. This study supports work conducted by Cramb (2005) because the key findings indicated that regardless of positive or negative perceptions on farmer’s conservation habits, consumers would be more willing to pay for water conservation practices. Since water conservation is a universal issue, which will require curbed habits from consumers and farmers alike, a water-care program would provide initiative to all groups.

It would also be recommended that Extension educators increase their influence on policy development with water conservation through social capital investments (Jones et al., 2011). Since Extension educators are already building social capital within their respective communities they should be used as assessors of the public that in turn advocate their findings to policymakers. Having messages delivered to policymakers, consumers, and farmers from an accredited source is an effective strategy for proper policy development (Lamm et al., 2016). The collaboration between
groups (Extension educators and consumers) would add validity when encouraging decision makers’ adoption of effective water policy (Lamm et al., 2016). These social capital assessments should be comprehensive to help identify limiting factors that later can be addressed in policy. Policy implementation in the future will be a significant influencer on water consumption and it is imperative social capital has a role to play in its creation (Jones et al., 2011).

Future studies should be conducted based upon these findings. Research should be conducted on the best environments for developing social capital through the proposed water-care programs. This study could include collecting information on offering education in formal versus non-formal group settings and the purpose of the group (Hoyman et al., 2016). Understanding the purpose of the group, whether created for social or economic interests, may change the effectiveness of water conservation behavior change and acceptance of sustainable practices. Therefore, Extension educators should be aware of such information as they develop programs of this type. Researchers should also evaluate the amount of social capital created through already existing water protection policies and programs. This future study could apply the research conducted by Lamm et al. (2016) in order to develop messages from accredited sources and develop as much social capital as possible.

References


Instructors’ Use of the Principles of Teaching and Learning During College Class Sessions

Daniel D. Foster¹ & M. Susie Whittington²

Abstract

The purpose of this study was to measure the frequency of utilization of the Principles of Teaching and Learning (Newcomb, McCracken, Warmbrod, & Whittington, 2004) during college class sessions. Process-product research was implemented (Gage, 1972; Rosenshine & Furst, 1973) using the Principles of Teaching and Learning Assessment (PTLA) (Foster & Whittington, 2010). Frequency of use of the Principles of Teaching and Learning (PT&L) was measured in six-minute intervals (Webb, 1970) during class sessions. The PT&L most present during classes was: Directed learning is more effective than undirected learning. The PT&L least present during classes was: Transfer of learning is more likely to take place when what is to be transferred is a generalization, a general rule, or a formula. Recommendations included professional development for faculty regarding awareness of the existence of the PT&L, and examples of implementation of the PT&L into classroom learning environments. It was recommended that both incoming and established faculty participate in faculty development regarding PT&L. Further research should be conducted using process-product methodology to describe principles of teaching and learning that most influence student achievement. In addition, research should be conducted to describe quality and intensity of the presence of the PT&L during class sessions.

Keywords: Principles of Teaching and Learning, PT&L assessment, effective teaching, engaged learning

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Introduction

What happens in higher education classrooms matters (Svinicki & McKeachie, 2014). Soheili, Alizadeh, Murphey, Bajestani, and Ferguson (2015) reported research showing positive student and educator relationships in classrooms influenced what students learned and achieved. The authors also reported research indicating that the classroom environment was the most influential variable in developing student attitudes and behaviors.

As early as 1907, evidence exists in the research literature to suggest that education researchers were searching for best classroom practices. The 1907 April issue of the Journal of Education contained article excerpts presenting a list of books related to the principles and practice of teaching in the U.S. (Books on Principles and Practice of Teaching, 1907). Doyle (1977) wrote that during the 1920s, a line of inquiry contrasting characteristics between distinguished educators and those considered less effective, flourished. He indicated that the 1950s saw a rejuvenation of

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research on teacher effectiveness when the American Education Research Association designated a committee specifically to study the classroom phenomenon of teacher effectiveness. In the subsequent quest to specify criterion on which to measure teacher effectiveness, education researchers across the next several decades proposed sets of principles for teaching and learning (Dunkin & Biddle, 1974; McKeachie & Kulik, 1975) and variables to study principles that were effective for student learning (Rosenshine & Furst, 1971).

**Process-Product Research**

As proposed sets of principles of teaching and learning continued to emerge from the teacher effectiveness literature of the 1970s, Gage (1972) emphasized the process-product research framework for studying the relationship between the principles of teaching and learning that educators were using in the classroom (process), and the effect the principles were having on student learning (product). According to Gage, the framework created a prediction formula: “Define the criterion and find its predictors” (Doyle, 1977, p. 165). Gage indicated that the process-product research formula was so simple and so general, any principle of teaching and learning could be inserted “and the empirical associations can then be calculated” (Doyle, 1977, p. 165).

Rosenshine and Furst (1973) wrote prescribed steps to follow when implementing the process-product research formula in assessing principles of teaching and learning: Step One) develop an instrument that can be used systematically to record the frequency of certain specified teaching behaviors; Step Two) use the instrument to record classroom behaviors of teachers and students; Step Three) rank the classrooms according to student achievement; and Step Four) determine the behaviors whose frequency of occurrence is related to achievement scores. Rosenshine and Furst also recommended that the process-product research framework be implemented in natural classroom settings.

As a final note regarding the use of the process-product research framework for assessing principles of teaching and learning, Gage (1972) called process-product researchers *improvers not describers* of teacher effectiveness. Gage considered the results of process-product research on principles of teaching and learning to have a direct impact on teacher education by improving classroom teaching practices and student learning.

**The Quest for Best Practices**

Examining and describing best practices related to principles of teaching and learning during college class sessions is overdue. Stakeholders investing in higher education systems are demanding evidence that learning is taking place (Kuh, 2001). Rice (2006) stated, “The search for best practices in university teaching has been an elusive one” (p. 20). In addition, the Association of Public and Land-Grant Universities (APLU), in 2009, called for the implementation of “faculty development, informed by research, on… the teaching/learning process” (APLU, 2009, p. 8).

As evidence of the quest for best practices in teacher education in agricultural education, in the *Journal of Agricultural Education* from 1988 to 2009, studies regarding best practices in terms of the methods taught in agriculture courses (Ball & Knobloch, 2005) were identified. Research on cognition in the teaching/learning process (Ewing & Whittington, 2009; Whittington & Newcomb, 1993; Bowman & Whittington, 1994; McCormick & Whittington, 2000) provided evidence of seeking to better understand practices occurring during class sessions. In addition, the agricultural education profession issued a call for improving student learning in their *National Research Agenda: Agricultural Education and Communication* (Doerfert, 2011), by specifically identifying a research priority area for developing “meaningful, engaged learning in all
environments” (p. 9). The call was renewed in the *American Association for Agricultural Education National Research Agenda 2016-2020* (Roberts, Harder, & Brashears, 2016).

Principles of Teaching and Learning

A review of literature revealed sets of principles of teaching and learning both in higher education (Willingham, 1977; Chickering & Gamson, 1987; McKeachie, 2002; Ramsden, 2003) and in the discipline of agricultural education (Lancelot, 1929; Lancelot, 1940; Hammonds, 1950; Stewart, 1950; Crunkilton & Krebs, 1983; Phipps & Osborne, 1988), with no universal set of principles of teaching and learning being adopted as a whole. Although a review of literature did not reveal one adopted set of principles of teaching and learning for the agricultural education profession, Ball and Knobloch (2005) found the most frequently required reading in agricultural education methods courses in preservice teacher preparation in agricultural education was *Methods of Teaching Agriculture* (Newcomb et al., 2004). Therefore, the set of principles of teaching and learning advocated by Newcomb et al. was selected for this study.

Principles of teaching and learning, at their theoretical core, embody critical evidence for studying student learning. Newcomb et al. described 16 principles of teaching and learning organized into five constructs: Organization and Structure of Subject Matter, Motivation, Reward and Reinforcement, Techniques of Teaching, and Transfer of Learning. The authors proposed the following classroom characteristics as evidence of the presence of the principles of teaching and learning, as categorized within each construct: organization and structure of subject matter, readiness, motivation, student involvement, student success, reinforcement and reward, directed learning, problem solving, supervised practice, and transfer of learning. Understanding the presence of these classroom characteristics, through evidence measured during college class sessions, is critical to improving student learning, and thus, the undergraduate educational experience (Whittington & Newcomb, 1991; Whittington & Bowman, 1994; McCormick & Whittington, 2000; Ewing & Whittington, 2007).

Purpose and Objectives

The purpose of the study was to describe the frequency of utilization of the Principles of Teaching and Learning by instructors in the College of Food, Agricultural, and Environmental Sciences at The Ohio State University. The research objective guiding the study was adopted directly from Step Two of Rosenshine and Furst’s (1973) prescribed steps to follow when implementing the process-product research formula for assessing principles of teaching and learning: *use the instrument to record classroom behaviors of teachers and students*. Step One of Rosenshine and Furst’s prescribed steps: *develop an instrument that can be used systematically to record the frequency of certain specified teaching behaviors*, was addressed in 2010 by Foster and Whittington when the Principles of Teaching and Learning Assessment (PTLA) instrument was developed and tested. Specifically then, the objective guiding this research, was to describe instructors’ frequency of utilization of the Principles of Teaching and Learning during college class sessions, as measured using the Principles of Teaching and Learning Assessment (PTLA).

Methods

After obtaining permission to conduct the study from the institutional review board human subjects’ research panel, the sample of instructors was obtained. The sample for this process-product study was instructors who held teaching appointments in The College of Food, Agricultural, and Environmental Sciences at The Ohio State University. Instructors were nominated by their respective department chairs as *good teachers* based on student evaluations,
exit interviews, and annual reviews of teaching. The instructors represented all departments in the college: Agricultural, Environmental and Developmental Economics; Animal Sciences; Food, Agricultural and Biological Engineering; Natural Resources; Horticulture and Crop Sciences; and Agricultural Communication, Education, and Leadership. Participation in the study was voluntary. Twelve nominated faculty members participated in the study. Researchers sought two observations and video-taping sessions of each instructor, but scheduling conflicts allowed every instructor to be observed once, while nine instructors were observed twice. Consequently, 21 undergraduate class sessions were videotaped for analysis. Courses in this study were undergraduate level ranging from one hundred (first-year) level to four hundred (fourth-year) level. There were an average of 50 students per class session.

The PTLA (Foster & Whittington, 2010) was the instrument used to identify frequency of utilization of the PT&L (Newcomb et al., 2004) during the class sessions. Reliability for the PTLA was established using test-retest procedures (Ary, Jacobs, Sorensen Irvine, & Walker, 2014). The research team of three individuals independently watched a randomly selected videotaped class session and recorded the frequency of use of the indicators for each of the PT&L as the teaching was observed. Data were used to confirm intra- and inter-rater reliability at a 90% confidence band, set a priori, for each PT&L.

Content validity for the PTLA was established by a panel of experts (Foster & Whittington, 2010). The panel of experts consisted of the senior authors of Methods of Teaching Agriculture (Newcomb et al., 2004). The panel of experts utilized for establishing content validity held the necessary expertise in college teaching to establish face validity for an instrument for assessing college instruction (Foster & Whittington). In addition, researchers worked under the assumption that the authors’ pre-established constructs from Methods of Teaching Agriculture were valid. The pre-established constructs used to organize the Principles of Teaching and Learning were: Organization and Structure of Subject Matter, Motivation, Reward and Reinforcement, Techniques of Teaching, and Transfer of Learning (Newcomb et al.).

In accordance with the PTLA instrument protocol (Foster & Whittington, 2010), and after intra- and inter-rater reliability were established by the researchers, videotaped class sessions were observed, and frequency of use of the PT&L was tallied on six-minute intervals (Webb, 1970). As each PT&L was observed, the corresponding time interval of occurrence was indicated. Principles were marked on the PTLA only once per six-minute interval, as the study was a measure of frequency, but not intensity nor quality of the use of the PT&L.

As can be seen in Figure 1, the total possible six-minute intervals for each class session was calculated by taking the number of minutes of the class session, dividing the minutes by six, and multiplying by sixteen (possible total frequency of uses of the PT&L). The total number of observations of PT&L was then divided by the total possible six-minute intervals.

<table>
<thead>
<tr>
<th>Number of observations of principles of teaching &amp; learning</th>
<th>41.25% of the six-minute time intervals showed a presence of a principle of teaching and learning</th>
</tr>
</thead>
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| Number of six-minute time intervals                        | % PTL = \[
\begin{align*}
\text{Number of observations of principles of teaching & learning} & \quad 66 \\
\text{Number of six-minute time intervals} & \quad 160
\end{align*}
\]

Figure 1. Example Calculation for Percentage of Utilization of Principles of Teaching and Learning during Class Sessions.
Findings

Class sessions ranged from 25 to 100 minutes (see Table 1). Twenty-one class sessions were analyzed totaling 1,127 minutes of instructional time, yielding 192 total six-minute intervals. Taking the number of six-minute intervals and multiplying by 16 (the number of PT&L) created the total number of possible intervals of 3,072 (see Table 1). There were 1,124 intervals showing evidence of the presence of a PT&L. Thus, 36.58% of all possible six-minute intervals showed the presence of one of the 16 PT&L.

The highest frequency of utilization of the PT&L was class session four with 54.56% (see Table 1). Class session six reflected the lowest frequency of utilization of the PT&L with 15.63%. The average frequency of utilization of the PT&L during class sessions was 36.81%.

The PT&L evidenced most in the six-minute intervals was Principle 10: Directed learning is more effective than undirected learning with 183 observations (see Table 2). The PT&L evidenced least in the six-minute time intervals was Principle 15: Transfer of learning is more likely to take place when what is to be transferred is a generalization, a general rule, or a formula with two observations (see Table 2). The construct with the most observations was Techniques of Teaching with 325 observations (see Table 3). The construct with the least observations was Transfer of Learning with 166 observations.

Conclusions and Discussion

The purpose of the study was to describe instructors’ frequency of utilization of the Principles of Teaching and Learning (Newcomb et al., 2004) during college class sessions, as measured using the Principles of Teaching and Learning Assessment (PTLA) (Foster & Whittington, 2010). It was concluded that the Principles of Teaching and Learning were utilized minimally in the college class sessions studied. It should be noted that the good teachers nominated by department heads for participation in this study, may not be representative of all faculty in the college. Therefore, if there is little evidence of the presence of the use of the PT&L among nominated good teachers, one could ponder the presence of the use of the PT&L among the general population of college instructors. If instructors are not utilizing the principles of teaching and learning during college class sessions, theoretically, a foundational, long-adopted educational practice is being missed during content delivery in college class sessions.
Table 1

Frequency of Utilization of the Principles of Teaching and Learning by Class Session.

<table>
<thead>
<tr>
<th>Session number</th>
<th>Length of class session in minutes</th>
<th>Number of six-minute intervals</th>
<th>Total possible six-minute intervals</th>
<th>Total observations of principles of teaching and learning</th>
<th>Frequency of utilization of the principles of teaching and learning (%)</th>
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Frequency of Utilization of the Principles of Teaching and Learning by Principle

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Table 3

Frequency of Utilization of the Principles of Teaching and Learning by Construct

<table>
<thead>
<tr>
<th>Construct</th>
<th>Total six-minute interval observations of principles of teaching &amp; learning</th>
<th>Total possible six-minute intervals</th>
<th>Frequency of utilization (%)</th>
<th>Percent of total observations (1,124 total)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. Organization &amp; Structure of Subject Matter (Principles 1 &amp; 2)</td>
<td>171</td>
<td>384</td>
<td>44.53</td>
<td>15.21</td>
</tr>
<tr>
<td>II. Motivation (Principles 3, 4, 5, &amp; 6)</td>
<td>224</td>
<td>768</td>
<td>29.17</td>
<td>19.93</td>
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<tr>
<td>III. Reward &amp; Reinforcement (Principles 7, 8, &amp; 9)</td>
<td>238</td>
<td>576</td>
<td>41.32</td>
<td>21.17</td>
</tr>
<tr>
<td>IV. Techniques of Teaching (Principles 10, 11, 12 &amp; 13)</td>
<td>325</td>
<td>768</td>
<td>42.32</td>
<td>28.91</td>
</tr>
<tr>
<td>V. Transfer of Learning (Principles 14, 15, &amp; 16)</td>
<td>166</td>
<td>576</td>
<td>28.82</td>
<td>14.77</td>
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</tbody>
</table>

The individual PT&L most present during college class sessions was: Directed learning is more effective than undirected learning. Thus, instructors were frequently observed directing learning during college class sessions. However, while directed learning was observed (i.e. a specific instructional strategy was being implemented by the instructor), the quality and/or intensity of the instructional strategy being used during the class session was not measured.

The individual PT&L least present during college class sessions was: Transfer of learning is more likely to take place when what is to be transferred is a generalization, a general rule, or a formula. According to Pugh and Bergin (2006), transfer of learning is difficult to accomplish. Pugh and Bergin asked the question, if transfer of learning is not the goal of higher education, than what it is?

**Recommendations and Implications**

According to Kuh (2001), academic administrators in institutions of higher education would benefit from examining that which they are doing to guarantee that stakeholders needs are being met, “including... a more intensive reexamination of the tried and true methods of instruction...
An opportunity exists to systematically increase the awareness of the existence of the principles of teaching and learning and how their presence can be exhibited in classroom teaching and learning. Professional development, designed to empower instructors to utilize the PT&L during class sessions, must be embraced. With the establishment of Professional Development Centers for teaching faculty on university and college campuses (Rice, 2006), traditional autumn faculty development workshops emerged. Since the use of the PT&L have the potential to challenge students to their fullest extent during content delivery, professional development personnel in teaching improvement offices on college campuses need to use the PT&L as a basis for providing continuous teaching improvement workshops, seminars, and in-service education to teaching faculty. Such workshops could offer topics related to using the PT&L during class sessions.

Professional development staff working directly with teaching faculty must explore the topics offered at education conferences, and provide subsidized registration for teaching faculty to attend workshops exploring the theory and implementation of the PT&L. Finally, incoming and junior faculty are potentially a starting point for targeting faculty with professional development discussions, perhaps in the form of brown bag seminars, regarding the PT&L and the challenges and benefits of applying them during college class sessions. When faculty are aware of and embrace the use of PT&L, student learning will benefit.

**Recommendations for Future Research**

Rosenshine and Furst (1973) wrote prescribed steps to follow when implementing the process-product research formula in assessing principles of teaching and learning: Step One) develop an instrument that can be used systematically to record the frequency of certain specified teaching behaviors; Step Two) use the instrument to record classroom behaviors of teachers and students; Step Three) rank the classrooms according to student achievement; and Step Four) determine the behaviors whose frequency of occurrence is related to achievement scores. Since step one was addressed by Foster and Whittington (2010), and Step Two was piloted though this study, completion of Step Three and Step Four are recommended for “Defin[ing] the criterion and find[ing] its predictors” (Doyle, 1977, p. 165) for the Newcomb et al.(2004) Principles of Teaching and Learning.

In addition, a large, heterogeneous sample size is recommended for analyzing the validity of the original 16 PT&L and their structure within the five constructs presented by Newcomb et al. (2004). In this study, the existing constructs were accepted as valid (Ary, Jacobs, Sorensen Irvine, & Walker, 2014); a future study could provide empirical evidence of the validity of the constructs.

The reexamination of what Bess (1998) called tried and true methods of instruction, is an ongoing recommendation in the quest for implementing best practices. Class sessions exemplifying the implementation of specific PT&L, could be observed and analyzed to describe impact on student academic achievement (Rosenshine & Furst, 1973). Sharing the findings with teaching faculty is necessary for moving process-product researchers to what Gage (1972) called improvers not describers of teacher effectiveness.

An additional recommendation for future research is that the PTLA instrument needs utilized with additional audiences including secondary and elementary learning environments. Researchers have advocated for measuring the frequency of use of the PT&L during class sessions as needed for documenting teaching effectiveness, and its relationship to student cognition (Whittington & Newcomb, 1990, 1993; Bowman & Whittington, 1994; McCormick & Whittington, 2000; Lopez & Whittington, 2002; Ewing & Whittington, 2007). College, secondary,
and elementary learning environments will benefit from measuring the frequency of use of the PT&L, and then modifying class session behaviors accordingly. As the PTLA continues to be used, research should be conducted for describing quality and/or intensity of the evidence of the presence of PT&L during class sessions.

Finally, it is recommended that studying the teaching effectiveness of faculty in the agricultural and related sciences, must continue to hold a place of prominence in the national research agenda for agricultural education, communication, and leadership professionals. After all, what happens in higher education classrooms matters (Svinicki & McKeachie, 2014).

References


A Comparative Analysis of College Readiness Assessment Results of Illinois High School Agriculture Students

David M. Mouser¹, Zhaohui Sheng², Andrew C. Thoron³, Andy Baker⁴ & Kevin J. Bacon⁵

Abstract

Agricultural education is defined by a best practice three-component model of instruction that includes a classroom experience, leadership development and FFA involvement, and an experience-based activity through a Supervised Agricultural Experience program (SAE). Based on program of activities award criteria, each year state FFA associations recognize top chapters with gold or silver emblem designations. This quantitative study provides a comparison of eleventh grade Illinois agriculture students from Gold and Silver Emblem FFA chapters to all Illinois eleventh-grade students on college assessments. In addition, it provides a comparison of Illinois agriculture students from Gold and Silver Emblem FFA chapters to all juniors tested from the same schools. Student identification numbers were securely collected from agriculture instructors and principals at qualifying schools and data were compiled by the office of the state board of education. The assessment results were analyzed and compared to determine if there were statistically significant differences that emerged between selected agriculture students and their peers using the ACT assessment designed to measure college readiness. Results indicated that the selected group of agriculture students are as college ready as their peers. Further analysis indicated that female agriculture students perform at a higher level than their peers on college readiness assessments.

Keywords: college readiness; agricultural education; effective programs

Introduction

Due to extreme financial crisis, school districts in Illinois have been forced to make substantial programmatic and staffing cuts (Bock, 2013). As a part of this process, districts have had to weigh the academic validity of each program. Agricultural education has held firm its goal of creating successful students and leaders for agriculture, other industries, or for success in further education (Smithers, 2012). According to the Illinois State Board of Education (ISBE) in 2011, 81% of agriculture programs in Illinois offer academic course credit in the areas of math, science, social sciences, consumer economics, and/or language arts. In the midst of a financial crisis in

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Illinois, it is more important than ever to be able to assess the academic performance of all programs including agricultural programs.

Though connections of agricultural education and content have been documented, little has been done in the area of researching the level of core academic proficiency associated with agricultural education students. However, agricultural education in the US has a well-documented history of integrating academic content through a strong emphasis in science and core academic content (Enderlin, Petra, & Osborne, 1993; Hearst, 1928; Hillison, 1996, Stimson & Lathrop, 1942). According to Myers and Thompson (2009), “research findings indicate that integration of academics into the agricultural curriculum is an effective way to teach math, science, and reading” (p. 75). Roberts and Ball (2009) stated “Further, as the educational climate oscillated toward a school wide emphasis on core academic knowledge (i.e., math, language, science etc.), agricultural education programs have also adjusted” (p. 88). Even with this curricular integration, agricultural education is defined by a best practice three-component model of instruction that includes a classroom experience, leadership development and FFA organization involvement, and experience-based activity through a Supervised Agricultural Experience (SAE).

In the wake of the No Child Left Behind legislation, the idea of college and career readiness has emerged as a formidable target for students and academic institutions (U.S. Department of Education, 2010). A Blueprint for Reform (2010) stated, “We will set a clear goal: every student should graduate from high school ready for college and a career, regardless of their income, race, ethnic or language background, or disability” (p. 3). As college and career readiness begins to emerge as a method of measuring success for programs, schools, and students at the secondary school level, it is of value to measure the effectiveness of agriculture programs through the same lens.

**Conceptual Framework**

As a measure of college readiness, several studies have shown ACT scores as a valid indicator of early college success as defined by freshmen GPA and first to second year college retention rates (ACT, 2010; ACT 2012; Allen, Robbins, Casillas, & Oh, 2008; Noble & Sawyer, 2002; Robbins, Allen, Casillas, Peterson, & Le, 2006). ACT scores have proven to be good indicators of success in freshmen level college coursework as related to college readiness benchmarks (Allen & Sconing, 2005). In a separate study, Radunzel and Nobel (2012) delivered research to indicate that ACT scores are useful in predicting the long-term success of college students, providing “further validity evidence for using them as measures of college readiness” (Radunzel & Nobel, 2012, p. ii.). The state-testing model in Illinois requires that all juniors in high school complete the ACT exam. This provides an attainable, reliable, and valid measure of college readiness for the population of Illinois juniors and the specific population of agriculture students. The consideration of state-testing, student enrollment in agriculture, and level of involvement by local school-based FFA Chapters led to the conceptual framework for the study.
With increasing emphasis on high-stakes testing performance, there may be a tendency to discount the value of performance in agriscience. The American Association for Agricultural Education research priority five (Thoron, Myers, & Barrick, 2016) stated priority questions central to this study through evaluating impacts of school-based agricultural education and by providing evidence-based investigations that indicated contribution to broader educational initiatives. Therefore, it is important to ascertain whether agriscience students are performing as well on standardized tests as other students not enrolling in or having the opportunity to enroll in agriscience which led to the purpose of the study.

**Purpose/Objectives**

Though much can be said about the progress and achievements of Illinois agricultural education through annual report data and anecdotal experiences associated with students, teachers, and industry leaders, no systematic investigation has been conducted to evaluate the academic validity of agricultural education programs or the academic performance of students served. To begin filling this void three specific student groups: Illinois agriculture junior students from Gold and Silver Emblem FFA chapters; all junior students from Illinois; and junior students from schools with Gold or Silver Emblem FFA chapters.

**Method/Procedures**

The study used a causal comparative design to identify the relationship between test scores and participating in the traditional three-part agricultural education program. “Some quantitative research designs have the purpose of explaining educational phenomena through the study of cause-and-effect relationships” (Gall, Gall & Borg, 2007, p. 306). In these designs, the cause of the phenomena would be considered the independent variable. The effect of the phenomena would be the dependent variable. Specifically, “Causal comparative research is a type of non-experimental investigation in which researchers seek to identify cause and effect relationships by forming groups"
of individuals whom the independent variable is present or absent or present at several levels—and then determining whether the groups differ on the dependent variable” (Gall, Gall, & Borg, 2007, p. 306).

This study examined whether the independent variable of being involved in an agriculture program, maintaining an SAE, and being involved in the National FFA organization consecutively in high school is related to the dependent variable of results on college readiness assessments as measured by the ACT. This led to the following research questions:

1. Is there a difference in ACT composite and subtest scores when Illinois agriculture students from Gold and Silver Emblem FFA chapters are compared with all Illinois students?
2. Is there a difference in ACT composite and subtest scores when Illinois agriculture students from Gold and Silver Emblem FFA chapters are compared with students from the same schools?

Population and Sample

This study examined three groups of students, each representing a slice-in-time sample of the larger populations. The first group (All Students) used for comparison in this study consisted of all juniors who completed the ACT in 2013 in Illinois. The second (Gold and Silver Ag) was those students at the Gold or Silver Emblem FFA chapter schools who participated in agricultural education. The final group (Gold and Silver All) was all juniors tested in 2013 who attended schools that held Gold or Silver FFA chapters. The data were collected through a survey of agriculture instructors at each of the qualifying high schools. Basic demographic factors were collected; however, no identifiable characteristics of students were attained, other than SIS numbers, to ensure complete student anonymity. All data for this study were taken from testing year 2012-2013.

The top agriculture programs in Illinois indicated by Gold or Silver Emblem FFA Chapters, based on program of activity rankings as released by the Illinois FFA organization for the year of 2012-2013 were identified. These schools maintain top FFA programs as judged by the state FFA association each year based on a comprehensive program of activities. Schools that are designated in the top categories of Gold and Silver Emblem chapters have a high likelihood of having students who have completed an SAE and maintained an FFA experience throughout high school (J. Craft, personal communication, March 4, 2013). As noted in the literature, the SAE experience is becoming increasingly rare; therefore, identifying schools with a high likelihood of this best practice component is a necessity (Cheek, Arrington, Carter, & Randell 1994; Dyer & Osborne, 1996). In addition, many studies conclude that SAE programs, when implemented, are not implemented in a consistent manner in many agriculture programs (Dyer & Osborne, 1995; Dyer & Williams, 1997; Retallick & Martin, 2005; Steele, 1997). All schools with Gold and Silver Emblem FFA chapters in Illinois (N=122) were then surveyed for secure Student Identification System (SIS) numbers for twelfth grade students who took Illinois state tests in 2012-2013 as high school juniors (Gold and Silver Ag).

The three groups were compared to determine if differences exist among the groups on ACT scores. These data were used to illustrate whether or not involvement in agriculture programs is related to college readiness as determined by scores on the ACT.
**Instrumentation**

This study used the college assessment exam developed and scored by the ACT organization. The ACT examination series has been used for decades to predict the college preparedness of high school students (ACT, 2012). The ACT series includes assessments in the areas of science, reading, English, mathematics, and an overall composite score. The widely accepted validity associated with the ACT examination in relation to college readiness provides a solid foundation for comparisons of groups within this study.

The ACT technical manual reports a scale score reliability associated with each portion of the ACT examination series. According to the ACT (ACT, 2007), in 2005-2006 the median scale score reliabilities associated with English was .91, mathematics .91, reading .85, science .80, and a composite median of .96. The median Standard Error of Measurement (SEM) associated with each test area was English 1.71, mathematics 1.47, reading 2.18, science 2.0, and a composite median SEM of .94 (ACT, 2007).

According to Gall, Gall, and Borg (2007), validity is defined as “the appropriateness, meaningfulness, and usefulness of specific inferences made from test scores” (pg. 306). Higher education institutions seek methods of assessing college readiness by compiling information related to individual students that includes high school performance, rigor of coursework, and performance scores on standardized tests like the ACT (Clinedinst, Hurley, & Hawkins, 2011). Colleges, for the purpose of college admissions and course placements, use the ACT series (ACT, 2007). It is widely accepted that the ACT is a valid predictor of college readiness (ACT, 2010c; ACT 2012c; Allen, Robbins, Casillas, & Oh, 2008; Noble & Sawyer, 2002; Robbins, Allen, Casillas, Peterson, & Le, 2006). The ACT technical manual provides numerous examples of validity studies and arguments for the purpose of framing the validity of the examination series (ACT, 2007).

**Data Collection and Recording**

With the assistance of the office of the Illinois State Board of Education, and Facilitating Coordination in Agricultural Education (FCAE), test score information and basic demographic information were compiled for this study using the SIS numbers provided by the schools in the sample. After initial test scores were received from ISBE, survey material was compiled for agriculture instructors and principals from participating schools. Initially, an electronic contact was made by the principle researcher and by FCAE staff indicating that the study was going to take place, and schools were encouraged to monitor mail and electronic communications as well as to participate in the study.

To collect the data needed to complete this study, an instrument was sent via mail and electronically to every agriculture instructor and principal from each of the 122 schools that were designated 2012-2013 Gold and Silver Emblem FFA chapters. The agriculture instructor in each school was asked to work with school administration and counselors to record SIS numbers for each agricultural education student who met the criteria for the study. Names and identifying information of students were not recorded or shared to protect the anonymity of students related to this study. The SIS numbers were provided electronically from each school to complete a final set of SIS numbers for students from all schools that voluntarily participated in this study. Participants were allowed five weeks to complete the information needed with the study. After two weeks, a reminder e-mail was sent to each school that had not returned the initial survey. A second reminder was sent electronically to schools that had not completed the data set after three weeks. Upon final collection of data from Gold and Silver Emblem FFA schools, the SIS numbers were shared securely through password protected spreadsheets with ISBE.
SIS numbers for all agricultural education students from Gold and Silver Emblem FFA chapter schools that took the state-mandated ACT examination as juniors during the 2012-2013 school year were provided to the state board of education. Illinois State Board of Education compiled the test scores per the FOIA request and returned the data without the SIS numbers included, ensuring complete student anonymity. The researcher at no time could determine any identifiable information with any test score or SIS number. After test scores were returned, statistical analysis was conducted for each area of testing associated with the study.

**Data Analysis**

The average ACT scores for this sample of students were compared to the averages of the overall populations of all Illinois students, and the secondary populations of all juniors from schools that housed Gold and Silver Emblem FFA chapters. The data were analyzed using SPSS. Demographic data collected on the sample of agriculture students were analyzed. A profile of agriculture students was created and compared with the general Illinois (All students) population as well as with all junior students (Gold and Silver All) who attended schools with Gold and Silver Emblem designations. One-sample $t$-tests were conducted to compare agriculture students’ (Gold and Silver Ag) test performance on ACT tests with students from the other two groups of (All Students), and all students from Gold and Silver Emblem FFA chapter schools (Gold and Silver All). The analysis was conducted using the ACT composite score and each of the subtest scores.

**Results/Findings**

Three distinct groups were part of the analysis in this study. These groups were all tested juniors in Illinois (All Students), Junior agriculture students from Gold and Silver emblem FFA chapters (Gold and Silver Ag), and all Junior students from schools that housed Gold and Silver Emblem FFA chapters (Gold and Silver All). Agriculture students had the lowest percentage of low-income students (15.4%), particularly in comparison to the overall state average of 49.9%. Table 1 lists demographic data on race, Limited English Proficiency (LEP), IEPs, and the number of low-income students as a whole for all Illinois students and students from the Gold and Silver Emblem FFA chapters. Demographics were listed for all students at all grade levels and were interpreted as representative of 11th grade students in the state.

### Table 1

**Demographic Data**

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<td>2,054,155</td>
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<td>Gold and Silver All</td>
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<tr>
<td>Gold and Silver Ag</td>
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<td>15.4</td>
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</tbody>
</table>

*Note. LEP = Limited English Proficiency; IEP = Students with an individualized Education Plan.*
Prior to data analysis, a distribution of scores was created for each ACT test area as well as for the ACT composite score to confirm that the data met the normality assumption for a one-sample \( t \) test (Urdan, 2010, p. 31).

A one-sample \( t \) test was used to compare the ACT score composite and subset scores for all groups. A \( p \)-value of .05 was used as cutoff for statistical significance (Urdan, 2010). The results are listed for ACT composite and each subcategory. Both composite scores and subtest scores are important because the composite score is used to determine college entrance or scholarships (ACT, 2012) and the subtest scores provide a picture of students’ academic strengths and weaknesses.

Table 2 shows 2013 ACT composite and subset scores for the sample of agriculture students. The ACT scores for these students indicates a mean score of 20.6 in reading, a mean score of 20.7 in math, a mean score of 20.5 in science, a 19.4 mean in English, and a composite mean score of 20.3 overall. These scores were then compared to the state averages for all juniors (see Table 3) using one-sample \( t \)-test for ACT composite test and each subtest (see Table 4).

<table>
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<th>ACT</th>
<th>( N )</th>
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<td>33.75</td>
<td>20.31</td>
<td>4.83</td>
</tr>
</tbody>
</table>

Table 3 indicates 2013 ACT composite and subset scores for all junior students in Illinois. The ACT scores for these students indicate a mean of 20.2 in reading, a mean score of 20.4 in math, a mean score of 20.0 in science, a mean of 19.4 in English, and a composite mean score of 20.1.

<table>
<thead>
<tr>
<th>ACT</th>
<th>( N )</th>
<th>Min.</th>
<th>Max.</th>
<th>( M )</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reading</td>
<td>144,081</td>
<td>1</td>
<td>36</td>
<td>20.19</td>
<td>6.23</td>
</tr>
<tr>
<td>Math</td>
<td>144,142</td>
<td>1</td>
<td>36</td>
<td>20.42</td>
<td>5.49</td>
</tr>
<tr>
<td>Science</td>
<td>144,081</td>
<td>1</td>
<td>36</td>
<td>20.01</td>
<td>5.53</td>
</tr>
<tr>
<td>English</td>
<td>144,024</td>
<td>1</td>
<td>36</td>
<td>19.41</td>
<td>6.65</td>
</tr>
<tr>
<td>Composite</td>
<td>143,924</td>
<td>1</td>
<td>36</td>
<td>20.14</td>
<td>5.54</td>
</tr>
</tbody>
</table>
As noted in Table 4, the results of the one-sample \( t \) test identified no difference between the groups for each of the subtest sections except for science. The analysis in ACT Science produced a significant \( t \) value (\( t (526) = 2.15, p = .032 \)). There is a significant difference in ACT Science test scores when comparing the gold and silver agriculture students to all Illinois students. An analysis of means revealed that the sample (\( M = 20.48 \)) had higher Science ACT scores than all Illinois students (\( M = 20.01 \)). Cohen’s \( d \) suggests the effect size is small.

Table 4

<table>
<thead>
<tr>
<th>ACT</th>
<th>Gold &amp; Silver Ag</th>
<th>All Illinois Juniors</th>
<th>( t )</th>
<th>( p )</th>
<th>( d )</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>( N )</td>
<td>( M )</td>
<td>( SD )</td>
<td>( N )</td>
<td>( M )</td>
</tr>
<tr>
<td>Reading</td>
<td>527</td>
<td>20.62</td>
<td>5.69</td>
<td>144,080</td>
<td>20.19</td>
</tr>
<tr>
<td>Math</td>
<td>527</td>
<td>20.72</td>
<td>4.76</td>
<td>144,142</td>
<td>20.42</td>
</tr>
<tr>
<td>Science</td>
<td>527</td>
<td>20.48</td>
<td>4.94</td>
<td>144,082</td>
<td>20.01</td>
</tr>
<tr>
<td>English</td>
<td>527</td>
<td>19.41</td>
<td>5.87</td>
<td>144,024</td>
<td>19.41</td>
</tr>
<tr>
<td>Composite</td>
<td>527</td>
<td>20.31</td>
<td>4.83</td>
<td>143,929</td>
<td>20.14</td>
</tr>
</tbody>
</table>

Table 5 provides the ACT composite and subset results for all juniors from schools that held Gold and Silver Emblem FFA chapters (Gold and Silver All). The ACT scores for these students indicates a mean score of 20.8 in reading, a mean score of 20.5 in math, a mean score of 20.4 in science, a 19.9 mean in English, and a composite mean score of 20.4 overall.

Table 5

2013 ACT Data For All Students in High Schools With Gold and Silver Emblem Chapters Schools (Gold and Silver All)

<table>
<thead>
<tr>
<th>ACT</th>
<th>( N )</th>
<th>Min</th>
<th>Max</th>
<th>( M )</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reading</td>
<td>4,601</td>
<td>3</td>
<td>36</td>
<td>20.81</td>
<td>5.93</td>
</tr>
<tr>
<td>Math</td>
<td>4,602</td>
<td>11</td>
<td>36</td>
<td>20.48</td>
<td>4.92</td>
</tr>
<tr>
<td>Science</td>
<td>4,601</td>
<td>7</td>
<td>36</td>
<td>20.41</td>
<td>5.06</td>
</tr>
<tr>
<td>English</td>
<td>4,602</td>
<td>6</td>
<td>36</td>
<td>19.85</td>
<td>6.07</td>
</tr>
<tr>
<td>Composite</td>
<td>4,602</td>
<td>9.75</td>
<td>36</td>
<td>20.39</td>
<td>5.02</td>
</tr>
</tbody>
</table>

Table 6 lists the results of a one-sample \( t \) test comparing agriculture students from Gold and Silver Emblem FFA Chapters and junior students from the same schools. In each of the comparisons, there was no statistical difference between the agriculture student sample and the FFA student chapter students.
Table 6

One-sample t test Comparing Agriculture Student Sample with Gold and Silver Emblem

<table>
<thead>
<tr>
<th>ACT</th>
<th>Gold &amp; Silver Ag. Students</th>
<th>Gold &amp; Silver All</th>
<th>t</th>
<th>p</th>
<th>d</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>M</td>
<td>SD</td>
<td>N</td>
<td>M</td>
</tr>
<tr>
<td>Reading</td>
<td>527</td>
<td>20.62</td>
<td>5.69</td>
<td>4,601</td>
<td>20.81</td>
</tr>
<tr>
<td>Math</td>
<td>527</td>
<td>20.72</td>
<td>4.76</td>
<td>4,602</td>
<td>20.48</td>
</tr>
<tr>
<td>Science</td>
<td>527</td>
<td>20.48</td>
<td>4.94</td>
<td>4,601</td>
<td>20.41</td>
</tr>
<tr>
<td>English</td>
<td>527</td>
<td>19.41</td>
<td>5.87</td>
<td>4,602</td>
<td>19.85</td>
</tr>
<tr>
<td>Composite</td>
<td>527</td>
<td>20.31</td>
<td>4.83</td>
<td>4,602</td>
<td>20.39</td>
</tr>
</tbody>
</table>

Subgroup analysis was carried out because the sample and the comparison groups differ in student demographics. ISBE provided the State of Illinois assessment information as averages without the ability to delineate between various groups involving gender or socioeconomic status. This did not allow additional comparisons to be made between the sample and overall state subgroups. Demographics of the agricultural student sample data were similar to the FFA chapter schools, differing more in gender and low-income. Since the data associated with the agricultural student sample and all junior students from Gold and Silver Emblem schools could be analyzed into subgroups, comparisons were made on gender and low-income between agricultural student sample (Gold and Silver Ag) and all students from the same schools (Gold and Silver All) data. Other factors or subgroups were not analyzed due to lack of adequate sample size.

Table 7 indicates comparison of (Gold and Silver Ag) to (Gold and Silver All) students on the basis of sex.
Table 7

ACT Sex Comparisons: Agriculture Student Sample (Gold and Silver Ag) vs. All Students from Gold and Silver Emblem Schools (Gold and Silver All)

<table>
<thead>
<tr>
<th>Sex</th>
<th>ACT</th>
<th>Gold &amp; Silver Ag</th>
<th>Gold &amp; Silver All</th>
<th>t</th>
<th>p</th>
<th>d</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>M</td>
<td>SD</td>
<td>N</td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>Male</td>
<td>Reading</td>
<td>270</td>
<td>19.99</td>
<td>5.58</td>
<td>2,347</td>
<td>20.52</td>
</tr>
<tr>
<td>Male</td>
<td>Math</td>
<td>270</td>
<td>20.63</td>
<td>4.78</td>
<td>2,348</td>
<td>20.62</td>
</tr>
<tr>
<td>Male</td>
<td>Science</td>
<td>270</td>
<td>20.19</td>
<td>4.96</td>
<td>2,347</td>
<td>20.52</td>
</tr>
<tr>
<td>Male</td>
<td>English</td>
<td>270</td>
<td>18.62</td>
<td>5.48</td>
<td>2,348</td>
<td>19.20</td>
</tr>
<tr>
<td>Male</td>
<td>Composite</td>
<td>270</td>
<td>19.86</td>
<td>4.69</td>
<td>2,348</td>
<td>20.21</td>
</tr>
<tr>
<td>Female</td>
<td>Reading</td>
<td>209</td>
<td>21.80</td>
<td>5.71</td>
<td>2,254</td>
<td>21.11</td>
</tr>
<tr>
<td>Female</td>
<td>Math</td>
<td>209</td>
<td>21.20</td>
<td>4.68</td>
<td>2,254</td>
<td>20.34</td>
</tr>
<tr>
<td>Female</td>
<td>Science</td>
<td>209</td>
<td>21.18</td>
<td>4.90</td>
<td>2,254</td>
<td>20.30</td>
</tr>
<tr>
<td>Female</td>
<td>English</td>
<td>209</td>
<td>20.87</td>
<td>6.15</td>
<td>2,254</td>
<td>20.54</td>
</tr>
<tr>
<td>Female</td>
<td>Composite</td>
<td>209</td>
<td>21.26</td>
<td>4.91</td>
<td>2,254</td>
<td>20.57</td>
</tr>
</tbody>
</table>

**Female ACT results.** The analysis of ACT reading and English scores for females produced a non-significant $t$ value. The analysis in ACT math for females produced a significant $t$ value ($t(208) = 2.66$, $p = .01$, $d = .18$) and in science ($t(208) = 2.59$, $p = .01$, $d = .18$). In addition, the ACT Composite Scores for females produced a significant $t$ value ($t(208) = 2.03$, $p = .04$, $d = .14$). These results show that female agriculture students outperform all females from the same schools in the areas of math and science. Cohen’s $d$ suggests that differences between groups are small.

**Males ACT results.** Each area of the analysis for males indicated non-significant $t$ values and thus no significant difference between gold and silver agriculture and gold and silver non-agriculture students were found.

Table 8 separates agriculture students into low and non-low-income categories and then compares their respective ACT Composite and subtest scores to the student scores from all FFA chapter students.
Table 8

ACT Income Comparisons: Sample (Gold and Silver Ag) vs. All Students from Gold and Silver Emblem Schools (Gold and Silver All)

<table>
<thead>
<tr>
<th>Income</th>
<th>ACT</th>
<th>Gold &amp; Silver Ag</th>
<th>Gold &amp; Silver All</th>
<th>t</th>
<th>p</th>
<th>d</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>M</td>
<td>SD</td>
<td>N</td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>Low income</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reading</td>
<td>81</td>
<td>18.64</td>
<td>5.41</td>
<td>1316</td>
<td>18.66</td>
<td>5.58</td>
</tr>
<tr>
<td>Math</td>
<td>81</td>
<td>19.21</td>
<td>4.59</td>
<td>1317</td>
<td>18.43</td>
<td>4.19</td>
</tr>
<tr>
<td>Science</td>
<td>81</td>
<td>18.91</td>
<td>4.59</td>
<td>1316</td>
<td>18.39</td>
<td>4.75</td>
</tr>
<tr>
<td>English</td>
<td>81</td>
<td>17.47</td>
<td>5.61</td>
<td>1317</td>
<td>17.17</td>
<td>5.65</td>
</tr>
<tr>
<td>Composite</td>
<td>81</td>
<td>18.56</td>
<td>4.60</td>
<td>1317</td>
<td>18.16</td>
<td>4.56</td>
</tr>
<tr>
<td>Non low income</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reading</td>
<td>446</td>
<td>20.98</td>
<td>5.67</td>
<td>3285</td>
<td>21.67</td>
<td>5.84</td>
</tr>
<tr>
<td>Math</td>
<td>446</td>
<td>21.00</td>
<td>4.74</td>
<td>3285</td>
<td>21.30</td>
<td>4.96</td>
</tr>
<tr>
<td>Science</td>
<td>446</td>
<td>20.76</td>
<td>4.96</td>
<td>3285</td>
<td>21.22</td>
<td>4.95</td>
</tr>
<tr>
<td>English</td>
<td>446</td>
<td>19.77</td>
<td>5.85</td>
<td>3285</td>
<td>20.93</td>
<td>5.90</td>
</tr>
<tr>
<td>Composite</td>
<td>446</td>
<td>20.63</td>
<td>4.81</td>
<td>3285</td>
<td>21.28</td>
<td>4.91</td>
</tr>
</tbody>
</table>

**ACT low-income.** The analysis in all areas of the ACT produced non-significant t values, suggesting that low-income students from the group performed similarly to those from the FFA chapters.

**ACT non-low-income.** The analysis of non-low-income students produced a non-significant t value ($t(445) = -1.36, p = .18$) in the area of math indicating no significant difference in math scores when the sample is compared to all students from the same schools. However, the results indicated significant t values in the areas of reading, science, English, and the ACT composite test scores. Gold and Silver all students tended to score high than the sample of Agriculture students (Gold and Silver Ag) from the same schools.

**Conclusions & Discussion**

Based on the results of the study, four conclusions are posited.

**Conclusion One: Agriculture students are as college-ready as their peers.** The results indicate that agricultural education students performed similarly to their peers in the area of college preparedness as measured by performance on the ACT assessment in all areas, with the exception of science. Agricultural education students performed significantly better than their peers when compared to all juniors in Illinois who took the ACT science assessment. Agricultural education has taken pride in its integration of core curriculum areas, including English, math, and science (Case & Cloud 2007; Conroy, 2000). The integration of science in various aspects of agriculture may explain the difference in science scores in relation to other areas. This study indicated that the level of college readiness for agriculture students is statistically and practically similar to all students in Illinois, and all students from the FFA chapters in which the students attend.
Conclusion Two: Female agricultural students have higher ACT scores than their peers. In 2013, agricultural education served 29,202 students in Illinois of which 37% were female. Females have become increasingly involved in agricultural education in both the classroom and FFA leadership positions in the last three decades (ISBE, 2013). The results of the study indicate that female agriculture students scored statistically better than all females from the same schools in the areas of ACT math, ACT science, and over-all ACT composite scores. In addition, females had higher mean ACT scores in all areas including ACT reading and ACT English than all females from the same schools. The results indicated that when compared to all females from the same schools, female students from the agriculture sample were more college ready than their peers. Caution should be urged however, since Cohen’s $d$ is small suggesting the effect size is small.

Conclusion Three: Non low-income agriculture students are less college-ready than their peers; however, low-income agriculture students are as college-ready as their peers. One outcome of the study indicated that non-low-income agriculture students performed below all non-low-income students from the same schools in the areas of ACT reading, ACT science, ACT English, and over-all ACT composite scores. However, the same students performed similarly to all non-low-income students in the area of ACT math. Cohen’s $d$ is small suggesting the effect size is small. It was also noted that low-income agriculture students performed similarly to all low-income students from the same schools. Review of mean scores showed that they had higher average scores in math and science when compared to low-income students in the FFA chapter schools. The differences that emerged in terms of low-income status involved the negative disparity of ACT scores when non-low-income agriculture students were compared to their peers.

Conclusion Four: Agriculture students perform best in the areas of math and science. Throughout the study, indications were that agriculture students seemed to perform highest on the math and science portions of the ACT college readiness assessment. This supported the literature that agriculture education emphasizes a science- and core-based curriculum (Dyer & Williams, 1997; Shelley-Tolbert, Conroy, & Dailey, 2000). Specifically, agricultural education in Illinois has utilized a science-based curriculum developed through support from the agricultural education line-item funding (Smithers, 2012). Though not statistically significant in some cases, the means seemed to indicate that students from the agriculture sample were most proficient in math and science than other areas. In each comparison, the scores in math and science were consistently the highest across the board when agriculture students were compared to all students from the same schools.

Contributions to the Field

This study added to the body of research on the academic validity of agricultural education programs. To date, no studies have examined the overall effectiveness of agricultural education programs to produce college-ready students as measured by performance on the ACT examination on such a large scale. This study provides a quantitative set of data that agriculture teachers, FFA Advisors, school boards, principals, and district superintendents can use to justify the inclusion and support of local agricultural education programs in communities in Illinois and throughout the United States.

A large body of research exists on the inclusion of core content in the agricultural education curriculum. In addition, the function of a best-practice model of the three-component model of instruction for agricultural education involving classroom instruction, SAE, and FFA involvement is well documented (Dailey, Conroy, & Shelley-Tolbert, 2001; Dyer & Williams, 1997; National FFA Organization, 2012; National Research Council, Board on Agriculture, Committee on Agricultural Education in Secondary Schools, 1988; Smithers, 2012, Talbert, Vaughn & Croom, 2005). This study provides an analysis of the validity of both core curriculum inclusion and
functionality of the best practice three-component model of agricultural education delivery. The outcome is a quantifiable analysis of the level of success that agricultural education is attaining toward college readiness for students.

Finally, as communities, school boards, and school administrators seek to determine programming for schools that meet the college and career readiness needs of their students, agricultural education should be considered a viable component in academic and workplace preparation. This research serves to promote the academic successes documented toward agricultural education providing increased college and workplace readiness, especially in the areas of mathematics and science. The academic validity of agricultural education programming has been supported by empirical evidence.

Recommendations for Further Research

Suggestions for further research related to this study include the need for the study to be expanded or replicated over multiple years. This study provided only a one-year slice-in-time comparison of students. A multiple-year analysis would help to validate the results attained. In addition, replicating the study in other states would be of benefit to determine if the results differ from state to state. Also, there are many concerns with collecting student data to ensure complete anonymity for students and confidential data. This study provided test score comparisons, but failed to provide any other information about the students in the sample other than their significant involvement in agriculture programs and basic demographics due to the priority of not collecting any identifiable information. If a researcher could find a way to glean more information about the students in the sample, such as grade point average, class rank, and other course selections, it might serve to provide an even clearer picture of the students and potential outcomes. Also, although every effort was made to have agriculture teachers and principals respond to the survey request in this study, the voluntary nature of the research allowed for several schools to be left out of the study. Though the respondents allowed for a clear set of data and results to emerge, a larger number of students and schools should be identified to increase sample size, if possible. Finally, it is recommended that other career and technical education areas replicate the study to determine if similar results emerge across career and technical education content areas.

Recommendations for Practice

Agriculture teachers. Agriculture teachers should use this study to help build upon the skills that emerged as strengths, and those areas that emerged as needing improvements. Recommendations for practice for agriculture teachers include supporting the inclusion of SAE programs as an integral part of every program for every student. This emphasis on math and science must be maintained and expanded. This research also provides room for improvement in the areas of reading and English for agriculture students. As literacy continues to be of great importance in the Common Core State Standards, agriculture teachers are encouraged to provide meaningful opportunities for agriculture students to improve reading and writing skills. Finally, agriculture teachers should share this research with stakeholders to facilitate support for their programs and efforts to maintain best practice models for agricultural education.

Superintendents and principals. Administrators should utilize this research to help facilitate discussions about the validity of supporting agriculture programs in their schools and communities. The results indicated that agriculture programs are a valid college and career ready delivery model for students. In addition, the delivery model of agricultural education can be expanded to other curricular areas by encouraging deep application of material and leadership
opportunities for students across content areas. As administrators in Illinois are continually striving to offer impactful programming to students while under the pressure of decreased financial resources, this study provides an example of how agricultural education can be a valuable academic component for schools.

**Boards of education.** Boards of Education should utilize this research to validate support for existing programs and for the expansion of agriculture programs in local communities. The career readiness results should be of particular interest to school boards as they indicate that agriculture students attain a higher level of workplace readiness than their peers. This indicates potential educational and economic impact to local communities by supporting a homegrown, career-ready work force through supported local agricultural programming.

**References**


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http://dx.doi.org/10.5032/jae.1994.02001


http://dx.doi.org/10.5032/jae.2000.04073


Previous Experience Not Required: Contextualizing the Choice to Teach School-Based Agricultural Education

Adam A. Marx1, Amy R. Smith2, Scott W. Smalley3 & Courtney Miller4

Abstract

The purpose of this study was to identify key career choice items which lead students without previous experience in school-based agricultural education (SBAE) to pursuing agricultural education. The Ag Ed FIT-Choice® model adapted by Lawver (2009) and developed by Richardson and Watt (2006) provided the investigative framework to design this study. Findings were organized around categories of the Ag Ed Fit-Choice Model (Lawver, 2009) with the exception of one additional category, believed unique to this group. Two focus groups were assembled to include ten participants. A myriad of experiences led participants to consider SBAE as a career. Certainly, it can be concluded that a passion for agricultural education does not solely stem from prior SBAE experiences. The intrigue toward the varied content associated with agriculture played a substantial role in participants’ choice to teach agriculture. Participants’ reflections revealed a distinct interconnectedness of domains within the Ag Ed Fit-Choice® model and the way in which this group of future teachers reflects upon career decision. Further, participants engaged in near constant value-checking and introspective career evaluation resulting through field experiences. The present study generated additional questions on the most effective ways to recruit future SBAE teachers who are non-traditional SBAE students.

Keywords: preservice teachers, teacher education, SBAE, recruitment, non-traditional students

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Introduction

The shortage of school-based agricultural education (SBAE) teachers across the United States is not a newly emerging issue. In fact, Camp (2000) reported a shortage of SBAE teachers has been a prevalent concern, even as early as 1921. This shortage was likely due to a burgeoning new career field and new secondary program demand. More recently, within the past decade, an average of 71% of qualified SBAE teacher candidates chose teaching as their career with remaining graduates choosing alternative professions (Kantorovich, 2010; Foster, Lawver, & Smith, 2015). Filling the need today involves both meeting the marginal program expansions and replacing those leaving the profession. Hereafter, efforts to expand the profession and meet the needs of local...
programs should focus on the recruitment of more qualified candidates into agricultural teacher education programs (Ball & Torres, 2010; Kantrovich, 2010).

Summary data from each iteration of the national supply and demand studies for teachers of agricultural education spanning the last 50 years have informed the profession of consistent annual shortages (Camp, 2000; Kantrovich, 2007; 2010; Foster, Lawver, & Smith, 2016). Within the profession, recommendations consistently indicate the necessity for stakeholders in agricultural education to recruit our own and positively portray the profession of teaching. Park and Rudd (2005) indicated SBAE teachers are credited by their students for serving as a role model toward selecting teaching as a career. Beyond current teachers, options for improvement do exist in the amalgam of recruitment approaches teacher education programs currently employ (Calvin & Pense, 2013). Lawver and Torres (2011, 2012) recommended recruitment efforts and strategies focused on populations outside of SBAE and further study of agricultural education majors and current teachers who do not possess the typical SBAE background found amidst SBAE teachers. It appears that expecting current SBAE programs to produce all future teaching candidates is not realistic. Certainly, such a narrow approach to recruitment ignores the opportunity for connecting with prospective teachers outside of SBAE. As such, how might we reconfigure the recruitment process for SBAE to attract and invite a more diverse candidate population?

Review of Literature

A few minutes spent scrolling through the Teacher Shortage Area Nationwide List (Cross, 2016) will reveal a diverse inventory of shortage areas within specific teaching fields across the most recent 25 year period. Several fields are consistently found on this list year in and out, among the membership is agricultural education. Within our profession we have diligently tracked and reported the disparity between the demand from local program openings to the supply of teacher candidates from our universities through the supply and demand studies (Camp, 2000; Kantrovich, 2007; 2010; Foster, Lawver, & Smith, 2016). The shortfall of initial graduates who choose the SBAE classroom is only one piece to the puzzle. Ball and Torres (2010) offer summative perspective to our perennial challenge:

It is important to note that the agriculture teacher shortage at the secondary level is not due to a shortage in the total number of graduates in agricultural education at the postsecondary level, but rather to the number of graduates who choose to teach initially, as well as the number who choose to remain in teaching on a long-term basis. Thus, regardless of the source of the problem, the solutions to the teacher deficit are recruiting and retaining teachers of agriculture (p.270).

In order to create effective mechanisms and evolve current recruitment methods of teachers, it is important to recognize how people come to choose teaching as a career. Extant literature primarily addresses teacher career choice beneath the umbrella of motivation. In particular, reasons for pursuing teaching are identified through altruistic, intrinsic, and extrinsic motivations (Kyriacou & Coulthard, 2000). Lawver and Torres (2011) reported intrinsic factors and drive to pursue teaching demonstrated the greatest predictive power toward describing career choice. Bastick (1999) concluded motivations to enter into the teaching profession including job security, salary, and work schedule according to a study of Jamaican pre-service teachers. Kyriacou and Coulthard (2000) buttressed those findings in a study of undergraduates who were identified into groups as pro-teaching, undecided, and anti-teaching. The pro-teaching camp approached the decision from an altruistic and intrinsic desire to serve as an educator. The anti-teaching camp did not view the same career characteristics as advantageous. The undecided group however, offered the most room for recruitment tactics as tailoring strategies toward the areas they found important in a career could sway them toward teaching as a professional choice (Kyriacou & Coulthard,
Thereby, according to their study, efforts of recruitment should focus on those who are not opposed to teaching as a career by providing those undecided candidates with reasons to choose education. Teaching appeals to those who believe it offers them the career attributes they set out for in career selection/exploration (See, 2004).

In addition to getting candidates to choose the profession in the first place, we must also contend with teachers leaving the profession early in their career for myriad reasons. Recent data from the National Center for Educational Statistics (Golding, Taie, Riddles, & Owens, 2014) indicates nationwide on average, eight percent of teachers within their induction years (1-3 years) left the profession during the measurement periods of 2004-2005, 2008-2009, and 2012-2013. Amounting to over 250,000 teacher openings beyond retirements. These findings are in contrast to figures Ingersoll (2003) reported in the range of 40-50 percent attrition within the induction years. Pertinent to SBAE within the Golding et al. study, they reported slightly higher attrition rates among teachers in rural areas (8.4 %) and those with a base salary of less than $30,000 (14.8%) as compared to attrition among all other teachers.

Research and writing within agricultural education indicates the secondary agriculture teacher positively influences their students’ career decisions in general (Esters & Bowen, 2005; Fraze, Wingenbach, Rutherford, & Wolfskill, 2011; Priest, Ricketts, Navarro, & Duncan, 2009; Marx, Simonsen, & Kitchel, 2014; Wildman & Torres, 2001), but more important to the present study, students’ decisions to pursue teaching (Ball & Torres, 2010; Lawver & Torres, 2012; Park & Rudd, 2005). According Wildman and Torres (2001), top influences on students’ choice of an agriculturally related college major included prior experience in agriculture, other agricultural experiences, agriculture and extension professionals, and perceptions of the academic department. Individual aspects of the SBAE program do not seem to influence the decision to choose teaching as a career according to Lawver and Torres (2011). Although, students’ participation in SBAE had a positive relationship with their self-reported intent to teach.

Lawver and Torres (2011, 2012) recommended recruitment efforts and strategies with populations outside of SBAE. Further, they recommended pursuing research among agricultural education majors and current teachers who do not have the typical SBAE background most often studied. Additionally, we need to devise ways to recruit more candidates into agricultural teacher preparation programs (Ball & Torres, 2010). Existing SBAE programs are a bountiful source of prospective teachers, however what other sources exist that may supply a more diverse body of SBAE teachers to the profession? The present study will attempt to provide a greater understanding of the context to choosing SBAE as a career focusing specifically on pre-service students majoring in agricultural education without firsthand experiences as a secondary student in SBAE.

**Conceptual/Theoretical Framework**

The Ag Ed FIT-Choice® model adapted by Lawver (2009) and developed by Richardson and Watt (2006, 2007) provided the investigative framework to design this study. Designed within the context of the expectancy-value theory of motivation (Wigfield & Eccles, 2000), the Ag Ed FIT Choice® model provides a guide for describing why people choose the career of teaching in SBAE. Expectancy-value theory of motivation proposes, relative to goal achievement, that a positive relationship exists between the degree to which people place expectation to succeed and the value placed on the goal. These expectancies and values in due course influence the person’s effort and their willingness to perform and persist toward their goals. Expectancy-value theory aligns more closely to an efficacy construct, a belief in one’s self, than solely an outcome construct (Wigfield & Eccles, 2000).
The FIT Choice® model as developed and validated by Watt and Richardson (2007) aligns directly with the major premises of expectancy-value theory of motivation. The domains within the model of Task Return, Self-Perception, Value, and Fallback Career are flanked by the socialization influences (experiences) and the choice decision (outcome) at the right. The task return domain is comprised of the individuals’ perceptions of the career of teaching and the level of expertise required, the demands of the profession, alongside the evaluation of the social acceptability of teaching. Further, morale is the perception of how valued they feel teachers are by society and salary involves perceptions of income potential of the career. The self-perception domain involves the perceptions of their ability to be a quality teacher and if they perceive themselves as being a good candidate for teaching. Intrinsic career value involves an individual’s interest in the specific teaching subject area. Personal utility value addresses how the career fits personal career goals and the perception of ease in the profession (bludging). Social utility value describes the “desire to provide a service to society and make a worthwhile contribution” (Watt & Richardson, 2007, p. 175). Lastly, fallback career parses out how teaching emerged as a career choice for the individual.

![Figure 1. Ag Ed FIT-Choice® Model, Lawver (2009) adapted from Richardson and Watt (2006) and Watt & Richardson (2007).]
Purpose of the Study

The purpose of this study was to identify key career choice items which lead students without experience in the field of school-based agricultural education toward pursuing agricultural education. This study addresses Research Priority Area Five: Efficient and Effective Agricultural Education Program within the American Association for Agricultural Education’s National Research Agenda (Roberts, Harder, & Brashears, 2016). Specifically, the study addressed the following research questions:

1. What leads individuals without experience in SBAE to pursue teaching agriculture as a career choice?
2. What personal factors guides decision making toward SBAE?
3. What prior knowledge of SBAE influenced career decision making?
4. What aspects of SBAE captures interest in the profession?

Methods

The intent of this study was to provide description and context to the career choice process of those currently enrolled in a SBAE teacher preparation program but without first-hand exposure to school-based agricultural education as a secondary student. Therefore, this study employed a single-category focus group design (Krueger & Casey, 2009). The purpose of this focus group design is to attempt to reach theoretical saturation through the incorporation and preliminary analysis of separate homogeneous groups. Saturation is reached once no new insights are observed with the addition of groups (Krueger & Casey, 2009). Data are analyzed across groups seeking patterns and themes. Procedures and materials for the focus groups were organized according to the design recommendations of Krueger and Casey (2009). In an effort to establish common ground amongst the researchers, we created a written plan to further articulate and clarify study objectives, number of groups to be conducted, participants to invite, plan of action, and a timeline. Ten (\(n = 10\)) guiding questions were decided upon designed around the Ag Ed Fit-Choice® Model along with a script to ensure consistency of instructions and delivery of prompts to the participants (see Table 1). Face and content validity of the guiding questions and script was established after thorough review by the three researchers and a panel of experts familiar with focus group research and the guiding model of this study. A critical incidents approach to analytic design (Krueger & Casey, 2009) was incorporated in this study whereby the key task was to identify the crucial events, actions, or situations of the individuals. In this case, the mission was to provide context to the events which led each participant to choose school-based agricultural education as a career.

Sample, Data Collection, and Analysis

Participants for this study were selected through purposeful means by the researchers from current students at North Dakota State University, University of Minnesota, and South Dakota State University. The researchers reside at each of these institutions and each advised students who fit within the parameters of the study. The process of screening involved criteria established by the researchers which included; a) a current student (undergraduate/graduate path) enrolled in a traditional licensure agricultural teacher education program, b) no previous school-based agricultural education exposure/experience as a secondary student. Focus groups were scheduled for the early evenings in the spring of 2016. The researchers incorporated a hybrid approach to data collection whereby a virtual meeting room was created for participants who were currently student teaching or located at an unreasonable distance from the in-person focus group site, allowing for those individuals’ involvement in the focus group. Collaborating researchers located off site also
participated by virtual means. The virtual room allowed for constant two-way communication between all participants and researchers within a classroom equipped with appropriate technology. Interview sessions were scheduled for up to 45 minutes. Krueger and Casey (2009) recommend between five and eight participants in each focus group. However, complexity of the researched topic can warrant fewer participants (four to five total) to help ensure all participants have the opportunity to adequately delineate their experience. Two focus groups were assembled to include 10 (N) participants. Focus group one included six (n=6) participants and four (n=4) in group two.

Table 1

Interview Question Alignment with FIT-Choice Model

<table>
<thead>
<tr>
<th>Interview Question</th>
<th>FIT-Choice Connection</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Tell us a little about yourself. Please share your academic program</td>
<td></td>
</tr>
<tr>
<td>(undergraduate/graduate) and academic level.</td>
<td></td>
</tr>
<tr>
<td>2 What are your career plans following graduation/degree completion?</td>
<td>Choice of Teaching</td>
</tr>
<tr>
<td>Describe the type of community/school/agricultural education program you envision serving.</td>
<td></td>
</tr>
<tr>
<td>3 School-based agricultural education offers students a broad variety of</td>
<td>PTLE, TDR, IV, PV*</td>
</tr>
<tr>
<td>content areas related to agriculture, food, and natural resource science. What life experiences or activities contributed to your interest in these areas?</td>
<td></td>
</tr>
<tr>
<td>4 How (or from whom) did you learn that school-based agricultural education was a career option?</td>
<td>PTLE, FC, SP</td>
</tr>
<tr>
<td>5 What led you to pursue teaching agriculture as a career?</td>
<td>PTLE, FC, SP, PV, SU</td>
</tr>
<tr>
<td>6 Who, if anyone in particular, has encouraged you or supported your decision to pursue teaching school-based agricultural education?</td>
<td>SP, PV, SU</td>
</tr>
<tr>
<td>7 Can you identify any factors that have discouraged or challenged your decision to teaching pursue school-based agricultural education?</td>
<td>SP, PV, SU, TDR</td>
</tr>
<tr>
<td>8 From a career perspective, what aspect(s) of school-based agricultural education are particularly appealing to you? Why?</td>
<td>SP, PV, SU, IV, TDR</td>
</tr>
<tr>
<td>9 What aspect(s) of school-based agricultural education are least appealing to you? Why?</td>
<td>SP, PV, SU, TDR</td>
</tr>
<tr>
<td>10 Considering the following list of potential “influences” on teaching agriculture as a career choice, which would you say have been the greatest encouragers/discouragers to your decision to become a school-based agriculture teacher: And Why?</td>
<td>PTELE</td>
</tr>
</tbody>
</table>

Note. *PTLE=Prior teaching and learning experiences, TDR=Task demand and return, SP=Self-perception, IV=Intrinsic career value, PV=Personal utility value, SV=Social utility value, FC=Fallback career.

A brief description of each participant is provided for context. We created pseudonyms for each to aid in protecting their anonymity. Leslie grew up in a small rural town and was in dance
with a friend who was heavily involved and she became interested. She will complete her student teaching and graduate in the fall of 2016. **Kasey** is a senior who graduated in December 2016 following her student teaching internship. She grew up on a cattle and diversified crops farm. **Ginny**, a senior who completed her 12-week teaching internship and graduated in May 2016. An urban native, she has already accepted a teaching position at a small, urban, private school where she will charter a school-based agricultural education program. **Mary** pursued a double major of Agribusiness and Agricultural Education. She started a new program in her small rural hometown where she grew up on her family’s farm. **Heather** grew up in a small town and participated heavily in 4-H throughout her youth and exhibited livestock at her county fair.

**Ashley** sought SBAE through a master’s route following her undergraduate degree. She grew up in a small rural community and served our country through the armed services for over ten years. **Lauren**, a senior (on track to graduate in December 2016) completed her 12-week teaching internship, is an adult learner returning to pursue a degree in agricultural education after funding was cut for a nutrition education extension position she held previously. **Jon** is an adult learner, classified as a junior. He offers a passion for urban agricultural education though he has had limited exposure to traditional aspects of agriculture. **Erin**, a sophomore, grew up on a family dairy operation. As a result of her agricultural interest, she was involved in encouraging her high school to begin offering school-based agricultural education although the program didn’t begin until after she graduated. Lastly, **Margo** grew up on a small hobby farm and is a junior as of fall 2016. She worked with her high school to begin a school-based agricultural education program, but it never got started.

This study was designed and analyzed through a post-positivist lens and epistemology whereby we focused on more pragmatic approaches for description and application as opposed to purely extrapolative conjecture. All researchers participated in each iteration of data collection and met following the focus group to verify field notes, provide oral summary, and offer closure to each data collection as recommended by Krueger and Casey (2009). Following the data collection, the three researchers separately completed open coding of verbatim focus group interview transcriptions and field notes through the lens of the Ag Ed Fit-Choice Model theoretical model (Lawver, 2009). Prefigured categories (Crabtree & Miller, 1992 in Creswell, 2013) according to the theoretical model were implemented. Codes were grouped and categorized into the constructs analogous to the Lawver & Torres (2012) model for teacher career choice. Trustworthiness of data was established using recommendations from Creswell (2013), Krueger and Casey (2009), and Yin (2009) through triangulation of data sources and the use of multiple investigators to provide consensual validation of the analysis and dimensionality to the data itself. Further, the researchers possess a deep knowledge of agriculture, agricultural education, and career decision-making to support the construction of the interview transcript and to interpret participant dialogue. Following careful analysis of video, audio, and reading transcripts separate findings were ultimately reconciled by the researchers to appropriately represent the experiences of the participants. Finally, participants were asked to review the findings in an effort to provide a confirmable and dependable reporting.

**Findings**

The findings were organized around categories of the Ag Ed Fit-Choice Model (Lawver, 2009) with the exception of one additional category, believed unique to this group. This section represents the participants’ experiences and pathways toward selecting agricultural education with preliminary intentions to teach.
Prior Teaching & Learning Experiences (and Influences)

Prior experiences with teaching, whether in a formal, non-formal, or informal environment help shape the choice to teach and the interest in the specific profession. Considered with the experiences are the people who helped encourage or dissuade our participants from teaching SBAE. Within our interview transcript, questions three, four, five, and ten supported content for this construct. Related to prior teaching and learning experiences, many of our participants reported receiving positive encouragement from those within the teaching profession throughout their academic career. In many cases, participants commented that one or more teachers had stated that he or she may “be a good teacher”. The simple statement then planted the seed, nudging them to consider the teaching profession, when otherwise they likely would not have considered it. Jon indicated that certain teachers including his university advisor made him “feel as if I belonged in the education field, just because of the way I can connect with people.”

Participants reflected upon a variety of non-formal teaching experiences which built efficacy for pursuing teaching. The experiences were as broad as instructing youth as a camp counselor to overseeing adult education in nutrition. These experiences were instrumental in guiding participants towards the career path of pursuing Agricultural Education. No matter the path to SBAE, preservice teachers in this study largely expressed a prior vision to teach which was continually reinforced by positive experiences working with youth.

While the passion for working with youth lead participants to teaching, their passion for agriculture was often propelled by a previous experience in an agriculture field. These experiences ranged from family involvement in production agriculture, 4-H, and work regarding community garden or nutrition, and agriculture development team with the military. These past experiences provided a solid foundation regarding enthusiasm for agriculture and participants often spoke of the desire for others to share similar experiences that agriculture can provide. Ashley recalled her military experience on an agriculture development team training Afghan women to raise and preserve their food: “They were eating what they were growing and they had pride, I was actually doing some good for that population which translates into I can come back and possibly teach.” First-hand experiences with others who had limited knowledge in agriculture or nutrition were often cited as an important catalyst to teach about agriculture. Lauren detailed her experience working with immigrant populations in [Large City] promoting consumption of fresh fruits and vegetables:

[after preparing a strawberry and spinach salad for a program], I had a lot of people come through and they asked, “What do strawberries taste like on their own?” and so it was just like a really eye-opening moment for me. Then I thought, you know, talking about nutrition isn’t really about fruits and vegetables it’s about access and availability. And so that is really where my interest in agriculture came to be.

Further, participants asserted that educating others to help “stomp out (agriculture) ignorance” was deemed a noble and worthy cause.

Tasks of Teaching

The Task Perceptions construct related to an individual’s choice to teach agriculture is divided into Task Demand (expert career, highly demanding) and Task Return (social status, teacher morale, and salary). Questions three, seven, and eight in our interview transcript addressed this construct. Participants in this study identified both areas influenced or encouraged them to pursue SBAE. In spite of anecdotal beliefs about diminishing societal views of the teaching profession, focus group participants commented on the positive outlook and perspectives among
the profession, and were encouraged by observing and experiencing strong teacher morale. Lauren offered, “in this program... you’ve got people saying, ‘Oh, this [profession] is wonderful! And, this is how you make it work in your current life situation’.”

Beyond the positive encouragement, the welcoming nature of the “Agricultural Education family” helped to nurture participants’ development as future teachers. The support network of people our participants found within SBAE during early field experiences in SBAE helped to solidify participants’ choice to teach. Ginny commented, “I have received so much support from other Ag teachers in [state].” Participants shared a positive perception of professional connectedness, feeling as if they were already a part of an existing community of practice. Kasey shared that she found support and comfort interacting with current female SBAE teachers, stating, “Once I met some female teachers I kind of had the mindset of, if they can do it, I can too.” Participants shared an overall positive perception of professional connectedness with current SBAE teachers and colleagues, as if they were already officially a part of an existing community of practice.

At the same time, SBAE was acknowledged as a high demand task requiring commitment and hard work. Erin summarized this belief, stating, “There’s so much we have to know. And, there’s so much to teach in the four short years you have [with students].” “Doing it all” in terms of lesson planning, handling classroom management issues, and promoting and marketing an SBAE program will inevitably be challenging and participants recognized those characteristics. However, they also recognized that the ever-changing nature of the agricultural industry and variety of content areas included in agriculture, food, and natural resource education ensure that a career in SBAE will never be monotonous or boring. Numerous participants elaborated on this, with Kasey offering, “It’s constantly changing... like, 15 years ago they weren’t teaching about GMOs.” More collectively, others added, “I like how in Ag classes there is always something new going on. You get up, you get out of your seat and do hands-on activities and labs.” Jon noted a strong affection for the science of agriculture, stating, “Agricultural education has so much science in it. And, I’m a big fan of science.”

Self-Perception

A perceived professional fit is an important aspect in choosing a career. The Self-Perception construct is the simplest in terms of dimensionality. Self-Perception is a person positioning themselves around the perceived ability to teach in both a holistic capacity as well as subject specific. Additionally, this construct involves how they view themselves as a potential teacher. Evidence supporting Self-perception was drawn primarily from questions six, seven, and eight. This construct was ultimately expressed through their desires to teach and images of their future within the profession. Participants’ perceived abilities were first expressed as a longtime desire to teach. Kasey and Erin stated “…teaching was always going to be a good career option (for me) …,” and many other participants were of the same mind.

While the longing to teach was evident for many preservice teachers, the type of content was often less clear. The desire to teach was met with a lack of passion for other subject areas, Erin and Mary similarly styled that “there was never a subject that I got super passionate about” or in some cases, even interest in core subject classes as Jon described; “I was going to be an English teacher, but I got bored of that really quick.” The participants discussed the challenges regarding teaching they believed to be most evident once they had their own program. Their own lack of experience with school-based agricultural education was an underlying concern. The participants expressed this void of association made it more difficult to connect with classmates (peers) within the teacher preparation program. Heather pointed out that “when over half your class has been state
FFA officers, and they’re like all talking about [their experiences] and you’re like sitting there like, cool, I have no idea what we are talking about, cool.” However, the participants extrapolated that they don’t need previous school based agricultural education to be successful in their teaching endeavors. Margo reasoned; “just because your dad was like an FFA advisor or you did this in your chapter doesn’t mean you’re going to be a better teacher than I will, just because you had those experiences.”

Teacher candidates discussed the type of school they imagined themselves teaching in the future. Most often they expressed a desire to teach in an environment similar to the school where they grew up. Heather stated “I grew up in a small community and that’s what I’ve always known.” Other participants articulated a need for agricultural education in a particular area matched their vision. “I think a lot of kids in the city could definitely learn so much from agriculture...”, noted Jon. The teacher candidates expressed their vision of the role agriculture played in the society and yearned to teach in a setting that would easily translate this perception.

Teacher candidates also mentioned interest in beginning a new program. Lauren was in contact with a school to begin a new program. “I told him about my interest and excitement with [Large City] public school.” Many participants indicated that starting a new program would allow them to make a direct impact in a way that was fulfilling for them. Mary concluded: “It was always kind of the plan to go back and start a program (at home) because I always wanted one when I was in high school.”

Values Toward SBAE

Alignment of values toward a career area comprises a substantial proportion of a person’s decision process. Within the Ag Ed FIT-Choice model, it is posited that the career seeker finds intrinsic value in the career of teaching agriculture. Meaning, they are motivated by the career and inherently value teaching as a career. Teaching aligns with their goals and their past. Questions three, five, six, seven, eight, and nine from our transcript of questions addressed this construct. Several participants cited the connection between teaching agriculture and their farm rearing and content interests as a propellant toward seeking this career path: “It [teaching SBAE] fits well with my passion for agriculture...” stated Heather. Others articulated that SBAE combined other interests for them, Jon reflected: “I’m great with people, [SBAE allows me to] be able to teach them something really cool. Ultimately, just “being able to work with kids” seemed value enough for the majority of the participants.

Alongside the intrinsic value felt toward the career, utility value was expressed richly throughout our conversations. The participants articulated their perceptions of a secure and transferable career which offered them the ability to seek out and live the type of life they ultimately envisioned for themselves. In particular, a few recognized the nationwide need for agriculture teachers as a sense of security for them and their family as Leslie stated; “My mom [is] reassured that I’ll have a job after college.” A broad applicability of a degree in agricultural education was an attractant for many of our participants. Kasey discussed her previous thoughts about entering into another Career and Technical Education (CTE) area and questioned: “What am I going to do with this degree [in another CTE area] if I don’t want to teach in the end?” Ashley, earning her teaching license via a graduate degree, described; “[While] doing the general agriculture degree path, I kind of got to the point where I graduated and said great, I know this stuff, now what do I do with it?” Our participants felt SBAE offered a diverse set of outcomes and preparation for whatever career opportunity was presented to them. Although, the inexorable fact that a teaching job may not be available near their family home did pose a sense of uncertainty within the participants. A further attractant which weighed in on a few of the female participants’ decision
process is the flexibility the career of teaching offers for their future family life as Kasey discussed; “…maybe one day having a family and still being on the same schedule that your kids would be on.”

The most influential factor with this group's' outlook toward SBAE seemed to revolve around their perceived social utility value of the career. In particular, the influence agriculture teachers have on their students was resoundingly encouraging across the board. Through field experiences Lauren reflected, “I watch the [ag] teachers have an opportunity to get a closer relationship with the students in ag than in other programs [or parts of the school].” Further she articulated, “I think ag is really good at capturing those students [who don’t fit in] and helping get them into something that would work for them, and help them to be successful outside of school.” Their outlook on the influence of the agriculture teacher spilled over into their overall view of the contribution to youth and society through working in SBAE. Agricultural education offers these future teachers the opportunity to teach in diverse ways, both methodologically and in content. “[What’s encouraging is] inspiring them to learn about the natural world instead of having them looking at a computer screen all day;” countered Jon. Others were ignited by “the hands-on learning aspect of it.” Each participant was nearing the final year or final requirements of their program and communicated an intentioned responsibility toward their future roles as teachers. Ashley articulated her observations and reflections on the program at her former high school:

If he [the ag teacher at her former high school] had promoted animal sciences or different plant sciences, or something, I might have gotten more interested in it. As a future ag teacher that’s probably one of my biggest goals is to make sure that I don’t just pigeon-hole an ag program.

Others identified additional responsibilities which encouraged them; “being a [ag] teacher I can try to rid the [misinformation] spread by the media about agriculture.” Further, they challenged themselves to “overcome society's view [of SBAE], they [students] don’t have to be from a farm to do it.”

Fallback Career

The Fallback Career construct was defined as teaching being a default choice divergent from the initial career choice. Questions four and five of our interview transcript aligned with this construct. Watt and Richardson (2007) stated that this construct is represented the “possibility of people not so much choosing teaching, but defaulting into it” (p.175). However, with the present group of pre-service teachers not so many of them defaulted into teaching as much as teaching may have chosen them. Participants often lacked knowledge about the existence of SBAE when initially seeking career options at the onset of college, therefore teaching agriculture was a fallback career for most. Many stumbled across the degree program, which initiated their interest in SBAE. Jon mused “I love the chemistry, but it didn’t love me, I had to try and find something else.” Wrestling with these career disconnects led many participants to seek out other opportunities. In searching, participants expressed they stumbled upon agriculture education by “just going to the University’s website and searching up some degree options” and sought to learn more on the field. Others found agricultural education earlier as Margo described:

I was involved with 4-H, but ...a local [FFA] chapter let some of us participate with some of their FFA events through like general livestock judging and showing and that’s basically where my FFA experience started and ended. But, one day I was sitting in a college health class and the teacher is telling us about how the meat
from pigs is only white meat. And that just kind of really irritated me and I argued my point, and she didn’t listen. And that’s … why I think Ag Ed is important. That’s kinda what I wanted to is kind of do is guide people from animal to plate on how their food gets there.

Although she didn’t have the opportunity to directly engage with SBAE as a secondary student Mary reported “I always wanted one [an SBAE program] when I was in high school. Then I came here and I kind of got introduced to it, and it all fell into place…” Many discovered the major as a result of prior career experience. Participants had worked with other organizations or companies and as a result found the major based on career interest. Ashley had been involved in the military for 18 years and had an agricultural background. Through her military experience, she recounted her deployment experience during which she helped Afghani women raise their own food and subsequently found the opportunity to pursue SBAE. Lauren was laid off from the extension educational program she worked with due to major budget cuts. She recounted:

we were given a two-year scholarship to the [University] and the last day I was on the job, my coworker and I were talking about what classes are you take. And I said well I don’t know what I’m taking. And she said well obviously you’re taking something because you got this two-year scholarship, so she sat me down and looked through all the possible programs and that is where I learned that Ag Ed was a thing. Because I told her, I said, “I think agriculture is cool, and I ultimately would like to do something with agriculture.” So, she helped me discover that that was a thing.

**Detractors - Intercultural Dynamics**

Throughout the focus groups and through analysis of the interview transcripts a new category or potential construct to the Fit-Choice model emerged, which didn’t appear to be fully addressed previously. We viewed the instances and attitudes which support this added construct as potential detractors toward candidates choosing SBAE as their career. The experiences our participants recalled seemed to fit rather cohesively into a new construct to explore further. They identified a professional culture with which they were unfamiliar and at times seemed excluding of their newness to the fraternity. Although participants did rationalize their lack of experience could be overcome, lack of experience with SBAE and the agricultural life in some instances created a degree of self-doubt related to the candidate’s perceived ability to succeed in the profession. Leslie offered; “I find that some of the classes are more difficult since I don’t have a background and I didn’t grow up on a farm or have those hands-on prior experiences.” Several participants cited related thoughts wondering if their lack of experiences would impact their ability to perform as a quality teacher and accomplish the triadic model of SBAE.

Participants identified many components of Agricultural Education specifically, regarding in-group lingo and behaviors, which posed challenges or potential barriers. Participants perceived that individuals with specific prior SBAE experiences comprised the in-group. “It definitely feels cliquey here and if you’re not a part of that group you feel left out…like the FFA lingo. There’s so many things, I still don’t know what Parli is really” discussed Ginny. Participants articulated a belief that this in-group believed they have a predetermined skillset for being successful in SBAE. Mary sarcastically recalled “when they refer to their ‘state officer year’, I just roll my eyes.” Margo shared, “It is discouraging talking with my classmates at time. They talk about all their success… I didn’t really have any of that.” Further, participants identified a lack of contemporary cultural competence in programs. Lauren stated, “FFA culture… prayers at meals exclude some students.
How do we fit all of this in and make this inclusive program [especially] when looking at it in terms of doing something (SBAE) in an urban setting?"

Conclusions, Implications, & Recommendations

The premise of this study was to provide context to the career choice process of a group of preservice teachers without experience in school-based agricultural education at three Midwestern land-grant universities. As such, unique participants in these focus groups presented important considerations for teacher preparation programs. As we reflected on the research questions of the study, we found as somewhat expected, that each individual trod a unique path to declaring agricultural education as a college major. Certainly, this study helps to shed light on new possibilities for recruitment venues for SBAE teachers. Although, the shared experiences discussed by our pre-service teacher candidates illuminated areas of internal reflection for our profession.

Myriad experiences led participants to consider SBAE as a career. Certainly, it can be concluded that a passion for agricultural education does not solely stem from prior SBAE experiences. Membership in 4-H, familiar experience with agriculture, military training on Agricultural Development Teams, or dietetics and nutrition training may each provide for diverse pathways to SBAE and have far-reaching implications for program recruitment (Calvin & Pense, 2013). To that end, how should programs and the profession be better promoted, so more prospective students are career aware and fewer “stumble upon it”? Recruitment activities should be aligned to reach non-traditional audiences. Members of such populations may be instrumental in advancing SBAE, particularly in urban and suburban areas. Possible activities could be as simple as promotion of teaching in SBAE through 4-H clubs across the state. Deliberate promotion of Agricultural Education across Colleges of Agriculture and related food sciences programs can expose SBAE to persons who may have never considered it as a career.

Participants expressed a variety of factors visible within the Ag Ed Fit-Choice® model, depending on their personal and programmatic experiences. Consistently, participants seemed to wrestle with personal and social intrinsic career value, similar to findings in See (2004). This could be due to participants looking at how they will balance time with family, job security, and shaping a professional future. Further, within the Ag Ed Fit-Choice® model there is an interconnectedness of domains and the way in which future teachers reflect upon career decision. Participants engaged in near constant value-checking and retrospective career evaluation resulting from field experiences. Engaging with the SBAE family through field experiences was recognized as an encouraging factor, as in other studies (Lawver & Torres, 2011; Park & Rudd, 2005). Through this study a new viewpoint of the professional culture emerged. Our participant’s perceptions of the profession and ultimate feelings of acceptance is shaped by their interactions with peers as well as current teachers. Peers within the post-secondary programs served as exclusionary roadblocks and was oftentimes off-putting. Teacher educators should be aware of how this impacts students without SBAE experience. Critical conversations involving all teacher preparation students and attention to professional attributes of each candidate may be helpful in addressing this challenge. Further, making purposeful decisions for field experience placements is essential toward creating an identity as a future agricultural educator.

We learned from this group that agriculture and food production and processing are cool topics which clearly draws a diverse pool of pre-service teacher candidates. Therefore, the intrigue toward the varied content associated with agriculture played a substantial role in our participant’s choice to teach agriculture. The role FFA plays within the SBAE program was not the impetus or really included in the equation for these candidates. In fact, FFA gave several concern of how to fully include and implement it alongside the curriculum. Participants talked about teaching...
agricultural content, they were motivated yet somewhat overwhelmed, by the content. As teacher educators this is an idyllic image, but is also fraught with implications. In order to operate as a total program each area within the triad needs considered and included. If not done so, the sustainability and identity of SBAE programs could be at risk. However, it may be worth the gut check in our profession to discuss whether we are first developing agricultural teachers or FFA coaches and which is most important to the sustainability of SBAE?

While it is undoubtedly important to value and engage SBAE teachers in the process of professional recruitment, is it too much to expect our current SBAE programs to produce all future teacher candidates? Beyond current teachers, options for improvement do exist in the amalgam of recruitment approaches teacher education programs currently employ (Calvin & Pense, 2013). Certainly we know the long term needs for qualified SBAE teachers will continue to place demand on existing SBAE programs to aid in producing potential post-secondary teacher candidates. However, this seemingly narrow recruitment approach ignores the recruitment of those potential candidates outside of SBAE who may be involved in and passionate about agriculture. Therefore, how can we inform and recruit those potential SBAE teacher candidates to pursue SBAE teacher preparation?

Future research involving the Ag Ed Fit-Choice® model and SBAE teacher career decisions could begin by replicating and expanding the present study. Similarly, comparing the choice to teach SBAE among those without SBAE experience to those with SBAE experience would provide further insight into influences and the decision process. Given the extreme shortage of teachers we continue to experience, alternative certification teachers proliferate within our profession. What things draw them to SBAE and further, why didn’t they choose teaching in the first place? We suppose there are many current teachers in service who likely fit with the description of our current participants. What drew them to SBAE and what has retained them in the profession to this point? Do their programs focus more heavily on the classroom and laboratory than their peers?

The present study generated additional questions on the most effective ways to recruit students who are non-traditional SBAE students. As stewards of SBAE, we must better understand the needs of all prospective SBAE teachers in order to recruit and retain more diverse teacher candidates.

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Agriculture Teacher Awareness and Application of Self-Regulation Strategies

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Abstract

This qualitative study investigated four rural Kansas high school agriculture teachers’ comprehension and implementation of self-regulation strategies in their own professional growth and in their instructional practice. The participants included two males and two females, each one having between five and 20 years of teaching experience. Participants were interviewed three times, using symbolic interactionism as the philosophical overview and the Seidman technique of interviewing. Three questions guided this study: 1) how do rural Kansas high school agriculture teachers make meaning of self-regulation and the processes needed to facilitate self-regulation, 2) in what ways do teachers self-regulate for their own professional growth purposes, and 3) what strategies do teachers use to foster self-regulation in their students? Findings suggest while participants described utilizing strategies associated with self-regulated learning, they most closely associated self-regulation with effort and motivation. Key implications for practice include incorporating a self-regulated learning focus into preservice education, specifically during microteaching and student teaching experiences. Recommendations for future research include exploring the effectiveness of self-regulated learning instructional strategies that hold promise for teaching teachers and students to utilize self-regulation cognitive strategies.

Keywords: self-regulated learning; agricultural education

Introduction

Between 2015 and 2020, the U.S. Department of Agriculture expects 57,900 high-skilled positions to open annually (Goecker, Smith, Fernandez, Ali, & Goetz Theller, 2015). As a part of Career and Technical Education (CTE), agricultural education has a need to prepare students not just for post-secondary academic pursuits but also for the workforce (Conroy, 2000). It is likely students entering the agriculture workforce will need critical thinking skills, and agricultural education potentially has the ability to facilitate these skills. Self-regulation may be an avenue to help students develop thinking skills, as Kuiper (2002) suggested, self-regulated learning (SRL) strategies can foster critical thinking and problem solving skills.

Self-regulation is considered to be a component of metacognition, which has been defined as “the awareness of and knowledge about one’s own thinking” (Zimmerman, 2002, p. 65). Zimmerman and Martinez-Pons (1986) described students as self-regulated when they are active in the learning process and plan, organize, and self-evaluate their learning. While metacognition is internalized and covert in nature, self-regulation can be both internalized and overtly physical. In a 2002 article, Zimmerman suggested research has shown self-regulatory processes lead to success.

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in school, but few teachers ask students to self-evaluate their work or assess their beliefs about learning, which results in students who are not prepared to learn on their own. Furthermore, research has not been conducted on whether agricultural educators employ self-regulation strategies in their instruction. Using a guide of 15 strategies they attributed to SRL, Zimmerman and Martinez-Pons (1986) found that higher achieving students reported using more self-regulated strategies than lower achieving students.

Knowledge of both metacognitive and SRL facilitating instruction may require more than a broad, generalizable set of strategies that can be used across all academic subjects. In order for transfer of metacognitive knowledge to occur to new situations, students need experiences in multiple contexts while acquiring the new learning (National Research Council, 2000). The real-world relevancy and ability of agricultural education to apply concepts in a concrete setting makes it a logical vehicle to help students learn to transfer self-regulation to other contexts.

The importance of self-regulation has been well documented (Bercher, 2012; Cleary, Platten, & Nelson, 2008; Hughes et al., 2002; Nota, Soresi, & Zimmerman, 2004; Zimmerman & Martinez-Pons, 1986; Zimmerman, 2002) and the need for teachers to educate students about these strategies established. However, research done in high school agricultural education programs to determine whether agriculture teachers incorporate self-regulation strategies into their instruction has not been found. The agricultural education model contains many components, including student leadership (FFA), experiential learning (SAE), and project-based learning (Classroom/Labatory) (Phipps, Osborne, Dyer, & Ball, 2007). This uniqueness provides significant opportunities for teachers to incorporate self-regulation strategies into their instruction.

Researchers have examined self-regulation processes in students with disabilities (Hughes et al., 2002) and general education classes (Zimmerman & Martinez-Pons, 1986) and have suggested that self-regulation is a key component of student success. However, in their study with 28 teachers Seraphin, Philippoff, Kaupp, and Vallin (2012) found it was common for both novice and experienced teachers to be unfamiliar with metacognitive strategies. The same study suggested that both novice and experienced science teachers could benefit from professional development focused on metacognitive science inquiry. As agriculture is perceived as an applied science – and agriculture teachers welcome the integration of science into the agriculture curriculum (Myers & Washburn, 2008) – agriculture teachers could also benefit from these opportunities.

While the research on self-regulation in other classroom settings abounds (Bercher, 2012; Cleary et al., 2008; Hughes et al., 2002; Munby et al., 2007; Zimmerman & Martinez-Pons, 1986), only a few Journal of Agricultural Education articles have examined metacognition in general (Pate & Miller, 2011a; Pate & Miller, 2011b; Pate & Miller, 2011c), with only one specifically studying SRL (Filcher & Miller, 2000). Prior research makes a compelling argument for the usefulness of self-regulation strategies in secondary education. Agricultural education, with its broad scope of curriculum, could potentially offer many opportunities to incorporate self-regulation strategies into its instruction. Because research on SRL is mostly focused on student use and less on teacher awareness, more information is needed about teacher awareness of SRL strategies.

**Purpose and Research Questions**

Because little is known about applications of self-regulation in agricultural education, this study attempted to establish a baseline of agriculture teacher awareness of self-regulation by investigating four rural Kansas high school agriculture teachers’ comprehension and implementation of self-regulation strategies in their professional growth and in their instructional practice. Focusing on agriculture teachers and their understanding of self-regulation provides...
insights into how they formulate their practice, as Askell-Williams, Lawson, and Skrzypiec (2012) suggested, the quality of teacher knowledge about the learning process influences teacher actions. Cleary et al. (2008) suggested that even though schools value the evaluation of students’ self-regulation processing, these processing skills are rarely evaluated by school personnel in a comprehensive manner. This presents a potential problem, as the National Research Council (2000) postulated metacognitive processes may remain unknown to students if they are not taught how to utilize them, “because metacognition often takes the form of an internal dialogue, many students may be unaware of its importance unless the processes are explicitly emphasized by teachers” (p. 21). What teachers know about self-regulation processes and how they can potentially facilitate these processes with students is the focus of this research.

The purpose of this study was explored through three research questions: 1) how do rural Kansas high school agriculture teachers make meaning of self-regulation and the processes needed to facilitate self-regulation, 2) in what ways do teachers self-regulate for their own professional growth purposes, and 3) what strategies do teachers use to foster self-regulation in their students?

Theoretical Framework

Zimmerman (1989) suggested that in order to qualify specifically as SRL, “learning must involve the use of specified strategies to achieve academic goals on the basis of self-efficacy perceptions” (p. 329). Self-regulated learning includes the following strategies: self-evaluation, organizing and transforming, goal-setting and planning, seeking information, keeping records and monitoring, environmental structuring, self-consequences, rehearsing and memorizing, seeking social assistance, and reviewing records (Zimmerman & Martinez-Pons, 1986). Self-regulation involves more than just knowledge of a particular skill; it also involves the understanding to be able to implement that skill knowledge appropriately with the behavior skill, self-motivation, and self-awareness that are needed (Zimmerman, 2002).

Zimmerman and Campillo’s (2003) model of self-regulation was used as a theoretical framework, allowing the researcher to interpret participants’ descriptions of self-regulating strategies. The Zimmerman and Campillo (2003) model broke self-regulation down into three cyclical phases; the Forethought Phase, Performance Phase, and the Self-Reflection Phase. The Forethought Phase includes both task analysis and self-motivation, with task analysis involving setting goals and planning for learning. Self-motivation is driven by one’s beliefs about learning and their own capacity to learn. It is also tied to the intrinsic value of the knowledge the learner is learning, meaning they are interested in the learning (Zimmerman, 2002).

The Performance Phase (Zimmerman, 2002) includes self-control and self-observation, with self-control referring to the deployment of learning strategies chosen in the Forethought Phase and self-observation referring to keeping track of or recording personal events. An example of a strategy in this phase would be a teacher using self-monitoring, a covert form of self-observation according to Zimmerman, to track her pacing while facilitating instruction. If, through self-observation, the teacher finds her pace to be too slow or too fast for students to keep up, she can take corrective measures.

The Self-Reflection Phase consists of self-judgment and self-reaction. Self-judgment can include self-evaluation, where the learner compares his/her performance against a particular standard of performance, or as Zimmerman (2002) suggested, self-judgment can also include causal attribution, where one attributes his/her success or failure to a specific cause. Self-reaction involves a learner reacting, either positively or negatively, to their performance. A positive reaction can increase motivation, whereas a negative reaction may cause a defensive behavior and a decrease in
motivation. Adaptive responses may also take place, causing one to adjust his/her methods in order to increase learning.

The process becomes cyclical when one uses self-reflections from previous events to engage in Forethought processes. According to Zimmerman (2002), self-regulation phases develop differently with novices compared to experts. Novices tend to self-regulate reactively, compare their performance with that of their peers, and typically do not engage in quality forethought. Whereas, experts set goals, have high levels of self-motivation, and evaluate their performance against their goals. Teachers may be empowered to better understand SRL processes by becoming familiar with how they personally apply the phases of self-regulation.

![Diagram of self-regulation phases and subprocesses](image)

**Figure 1.** Phases and subprocesses of self-regulation (Zimmerman & Campillo, 2003)

**Methods**

**Philosophical Overview**

To investigate agriculture teachers’ comprehension and implementation of self-regulation strategies, an interpretivist approach was employed (Merriam, 2002) using the symbolic interactionism methodology. Symbolic interactionism enabled the researcher to gain perspectives of the participants by focusing on the ways in which they make meaning of their experiences (Flick, 2009). Blumer (1969), suggested symbolic interactionism has three assumptions:

- human beings act toward things on the basis of the meanings these things have for them;
- the meaning of such things is derived from, and arises out of the social interaction one has with one’s fellows; and
- meanings are handled in, and modified through, an interpretive process used by the person in dealing with the things he encounters. (p. 2)
Based on these assumptions, Flick (2009) suggested research using the symbolic interactionism approach should focus on the different ways in which individuals under study make meaning of their experiences. Flick also recommended the researcher should aim to “reconstruct the subject’s viewpoints” (p. 58) in order to analyze social worlds.

**Subjectivity Statement**

As an agricultural educator and researcher seeking to comprehend the ways in which agriculture teachers make meaning of and employ self-regulation strategies, I examined and detailed how my own interactions and prior experiences in education impacted my own meaning of the study. Throughout elementary and middle school I was a strong academic student, but my first interaction with consistent, constructive feedback came in the form of competing in Career Development Events (CDEs), as it called for a necessary amount of criticism from my agriculture teacher in order for me to become more proficient at the task. My relationship with my agriculture teacher also had a definite impact on my decision to enter the agricultural education field. As a result of these experiences, I have strong feelings about the impact agricultural education can have on learners, and as a teacher I feel a strong sense of responsibility to my students. I assumed educators in this study shared similar beliefs concerning their diligence to students.

I have always believed myself to have effective study habits as a student, such as monitoring my studying environments, pre-planning what I was going to study and for how long, and seeking help from others. I did not know of a label to assign to these habits, nor do I recall where exactly I learned them. Some, I am sure, were explicitly taught to me as a youngster, but I feel as though I picked up many through observing others and their actions. My resulting assumption is that most SRL strategies are taught implicitly rather than explicitly in public education. My usage of self-regulation strategies as a student have carried over into my work as a professional. I often reflect on lessons and daily events as a teacher, always seeking to improve my instruction and seek advice from other more experienced teachers.

While not knowing the term for these strategies was “self-regulation,” I viewed them as important and beneficial to my growth as an educator. I feel as though I modeled the behaviors well, and encouraged students to self-evaluate their performances and products (especially in shop classes), but did not explicitly give instruction on these strategies and how they may impact the students. Through reflection on my teaching I realize the opportunities I had, but did not take advantage of, as an agricultural educator to incorporate self-regulation into my instruction. These opportunities are due to agricultural education being so broad and encompassing many different topics and interactions with students — agricultural educators have the opportunity to not only interact with students on cognitive tasks, but physical working tasks as well.

**Participants**

Participants were purposively selected utilizing input from Kansas Team Ag Ed members. Participants met the conditions of being a teacher employed in a Kansas Department of Education approved high school agricultural education program, with a course load consisting of at least 75% agriculture classes, and having more than five years and less than 20 years of experience. A majority of agricultural education programs are located in rural schools; therefore, selecting teachers from rural areas allowed the research participants to most clearly reflect the nature of agricultural education in Kansas. According to the National Center for Education Statistics (2011), 221 of the 312 Kansas school districts are located in rural areas.
Rice (2010) asserted a teacher is likely to grow most in effectiveness within their first five years of teaching, after which there is a plateau on improvement and the differences in pedagogy between a five-year teacher and a 20-year teacher are negligible. Therefore, the author determined to limit participant eligibility to those teachers with more than five years of teaching experience. This criterion allowed a focus on participants generally accepted as skilled teachers. Participants were limited to less than 20 years of experience in order to more accurately reflect the majority of Kansas agricultural educators’ experience. The number of participants was set at four to allow for perspectives of teachers within the five to eight-year experience range, the nine to twelve year range, the 13 to 16 year range, and the 17 to 20 year teaching range respectively.

Of the four teachers, two were female and two were male to account for potential different applications of self-regulation based on gender influences. Bidjerano (2005) found differences in self-regulating behaviors between genders, in that females surpassed males in their ability to use six strategies the researcher associated with self-regulation: rehearsal, organization, metacognition, time management skills, elaboration, and effort. It was suggested these differences could be due to gender impacting a proclivity of utilizing self-regulated strategies in their learning, females might have been more reflective about their learning or revealed a higher willingness to report their use of the strategies.

Pseudonyms were utilized in the study to protect participants’ rights and reference both the participant’s gender and their range of experience, as Aubrey and Claire were both females and Brad and Doug were both males, and the pseudonym beginning with “A” being the least-experienced. Aubrey had taught for six years, Brad for 12 years, Claire for 13 years, and Doug had taught for 20 years. Selecting four participants enhanced the trustworthiness of the study by allowing the researcher to gather different perspectives across experience level as well as gender.

Data Collection

To achieve an understanding of agriculture teacher awareness and application of self-regulation, the researcher utilized three semi-structured, in-person, in-depth interviews per participant following the Seidman interview method. Flick (2009) suggested semi-structured interviews are valuable because, as compared to more structured interviews, interviewees can more accurately establish their viewpoints. The Seidman Technique involves a three interview series, with each interview focusing on a particular theme with the participant. The three interviews on separate occasions allow the researcher to gain the participant’s perspective by understanding the context of their experiences, reconstructing their experiences, and then reflecting on the experiences (Seidman, 2013). Each of the three interviews per participant was approximately 90 minutes in length, providing more than three hours of data collection with each participant.

Focusing on the three research questions, the three interviews followed Seidman’s (2013) technique with each respective interview concentrated on the following: participants discussing themselves as a learner to set context; discussing themselves as a professional and teacher to reconstruct experiences; and reflecting on the meaning of those experiences. Participants’ discussion of themselves as a learner during the first interview was stimulated by prompts such as “Walk me through a typical day for you as a high school learner” and “Tell me about a time when you first remember thinking about your own learning.” For the second interview, participants were given prompts such as “Give me an example of a time when you made an instructional improvement” and “If I were to ask you to self-assess any aspect of your life, what steps would you follow?” Lastly, the third and final interview asked participants to reflect, and included items like “When reflecting on your teaching experience, does a student come to mind who could have
benefitted from self-regulation strategy instruction?” and “How might this study effect your instructional strategy use?”

A voice recording device was used during each interview to ensure precise transcription of data. All data transcription was completed by the researcher, with member checks and auditing completed after transcription in order to increase credibility and confirmability. Member checks were completed by emailing the transcribed text to each participant, which allowed the participant to review the transcribed data from the interviews and determine if the contents were accurate and representative of their feelings. This is considered a form of communicative validation - or trustworthiness (Flick, 2009). Auditing was completed periodically by a colleague not involved in data collection in order to cross-check themes, categories, and notes. Applicable and necessary revisions were then made based on the colleague’s recommendations. Flick suggested this allows for an increase in dependability of the research. Guba (1981) suggested audit trails increase the stability (dependability) and confirmability of research findings.

Limitations

Semi-structured, in-depth interview is a successful technique for understanding the depth of an answer to a question and for gaining deep insight into the feelings behind that answer in order to reconstruct the participant’s viewpoint (Flick, 2009). The qualitative nature prohibits generalizing findings to all secondary agricultural teachers in Kansas. Other limitations may also apply, such as: understandings are self-reported by teachers; student receptiveness to instructional strategies and class sizes may vary; socioeconomic status variance between schools and communities may impact resources available to students and teachers. In addition, variance between the 9 to 12 and 13 to 16 experience range was small (one year) as the level of experience was balanced with the other requirements of having a rural program with a predominantly agriculture course load.

Data Analysis

Glaser (1965) stated the constant comparative method of qualitative data analysis is “concerned with generating and plausibly suggesting...many properties and hypotheses about a general phenomenon” (p. 438). The researcher accomplishes this through four stages: comparing incidents to categories, integrating categories and their properties, delimiting the theory, and writing the theory (Glaser, 1965). During the first stage, the researcher compares incidents to categories. During this time theoretical properties of the category quickly emerge. Next, the coding changes from comparing “incident[s] with incident[s] to [comparing] incident[s] with properties” (Glaser, 1965, p. 440). The researcher records memos concerning theoretical notions, then reflects and deliberates about these notions, which produces clearer ideas on the emerging theory, and these recorded in memos. Next, the researcher reduces the theory to fewer, higher level concepts “based on underlying uniformities in the original set of categories of their properties” (Glaser, 1965, p. 441). Finally, the memos are used when writing the discussion.

After transcription, 170 pages of text were included in the data analysis process. Following the constant comparative method, the researcher first reviewed transcripts and identified open codes, or any bit of information that was relevant to the three research questions. Following the open coding process, codes were further analyzed and grouped into categories, sub-themes, and themes. Axial codes were highlighted and then pulled into a separate word processing document. Codes were constantly compared with other incidents until categories began to emerge. Once categories emerged, newly identified codes were then compared to the principles of the categories, continuously rearranging individual codes to fit their changing categories. As analysis proceeded,
the categories were then integrated into sub-themes, and the sub-themes into themes. Using the constant comparative method, six specific themes emerged from the data; teachers as learners, teachers focusing on their own learning, comprehension of self-regulation, application of self-regulation, teachers’ growth strategies, and self-regulating professional development.

Findings

After the six themes were determined, they were aligned with the research objectives of the study. The themes relevant to Research Question One: “how teachers make meaning of self-regulation and the processes needed to facilitate self-regulation” included teachers as learners, teachers focusing on their own learning, and comprehension of self-regulation. The themes relevant to Research Question Two: “in what ways do teachers self-regulate for their own professional growth” included teachers’ growth strategies and self-regulating professional development. The theme pertinent to Research Question Three: “what strategies do teachers use to foster self-regulation in their students” included application of self-regulation.

How do rural Kansas high school agriculture teachers make meaning of self-regulation?

Research question number one included three themes. The first theme, teachers as learners, explored how participants described their experiences as learners during their academic careers and included sub-themes motivation, learning methods, strategies used to improve, and metacognitive instruction. Participants all discussed their own need to be motivated and see value in learning, while their sources of motivation varied. Representative among the participants, Doug described a focus on the need for motivation, “I would say that if it interests me, I was a good learner. If it didn’t, then… struggle with it I guess… don’t know if struggle is the word, just didn’t try.” While not explicitly discussing self-regulation strategies, each participant exhibited characteristics of self-regulation, in that they were familiar with how they best learned and discussed an ability to cater to their desired style of learning. Their reflections were focused more on their actions and behaviors as students, and less focused on the cognitive processes that led to those behaviors.

The second theme, teachers focusing on their own learning, focused on when teachers began concentrating on the learning process, and their feelings toward teacher education. Relevant sub-themes included: became aware of learning in college, became focused on learning as novice teacher, and shortcomings of pre-service education experience. Participants mentioned they became more aware of their own learning as they started focusing on how they would use the new knowledge, as Aubrey stated, “my attitude changed when I got into college, ’cause I kept thinking about how am I going to use this to teach my students”, while Claire further discussed the need to start seeking out more information once she started college, “like thinking and seeking out knowledge, I would say that was probably more college level.”

The final relevant theme for research question one was comprehension of self-regulation, which described how participants made meaning of SRL and included sub-themes attributing self-regulation to personal preference and attribution of self-regulation to students. When discussing how participants make meaning of self-regulation, they often described an incomplete understanding by associating it with motivation and effort. Participants’ discussion of SRL frequently lacked elements of the second and third phases of the SRL model (Performance and Self-Reflection phases), as self-observation, monitoring, and assessing strategies were generally omitted. A focus on outward behavior also limited participants’ focus on the underlying cognitions leading to SRL strategy use.
Participants often attributed their personal success (or lack thereof) to motivation and effort when discussing their experiences as learners. As a representative statement, Doug suggested, “to me it just comes down to work ethic I guess. So that’s why I feel I was successful, because I worked at it.” They frequently emphasized needing to be motivated and cited different sources for their motivation, including parents and intrinsic need. Brad was one of the participants who cited his parents as a big motivator, describing a time when he earned a ‘B’ in a class due to lack of effort, and his mom “made that expectation clear to me that, that I needed to work harder.” When they reflected on themselves as students, they were more likely to focus on their behaviors and actions than they were to focus on their cognitions that led them to those actions, often failing to describe the underlying cognitive SRL processes that influenced their behaviors. The focusing on doing, and overlooking cognitions, could explain why participants also associated self-regulation with stereotypical “good student” behavior. Brad provided a typical statement describing a student who self-regulates, “you have got homework to do, are you going to do it? That is self-regulation, I mean regulating your own learning. Taking notes, is self-regulating, you know, without being asked, without being prodded, that is self-regulation.”

Participants frequently described meanings that relate to the first phase of the Zimmerman and Campillo (2003) model of self-regulation (the Forethought Phase), such as this comment from Claire discussing her own learning while emphasizing motivation, “if I want to get an ‘A’ in the class, this is what I am going to have to learn to get myself there, so it’s almost kind of a self-motivation to get whatever that knowledge is.” Participants tended to project their own emphasis on motivation to their students when discussing self-regulation, as Aubrey suggested, “making yourself learn, um, being self-motivated I guess. Being self-motivated is always the first thing that comes to mind when I hear that [self-regulation].” She again stated the importance of motivation while discussing students who underachieve, “kids that, that, I have that turn in weak work, I know for the most part can do better. They are just not focused.”

Participants also did not recall receiving instruction concerning metacognition or self-regulation at any point during their academic careers, Brad stated, “I don't ever remember being taught how to, you know, how to self-regulate” and Aubrey stated “never” when asked if she received any instruction on self-regulation strategies and even discussed teacher education, “I’m trying to think back, like teacher-ed stuff, I don’t remember them ever really going over, like, how to have your students do this to make them better learners.” However, participants did describe beginning to focus more on their own learning, and the learning process, once they entered college or as novice teachers. Brad gave an example,

Probably I didn't really think about my own learning until I was really in college… trying to figure out okay what is it that I need to know, what is it that I don’t need to know and you're kind of planning, scheduling…

Doug described not spending much time thinking about learning until he was a novice teacher,

…when I was in school, especially in student teaching, I was so focused on just getting it right, I don’t know if I was really understanding or grasping, um, about, you know, worrying about students’ learning styles, and how to get that figured out… definitely wasn’t about a reflection because it was all about proving what you could do…

Different responses were given for the cause of change in participants’ thinking, including the rigor of college and the actual learning by “doing” brought on by student teaching, as Claire
stated, “it wasn't until I was out doing that I became probably the learner that I am now.” Despite adaptations as learners in their professional lives, participants’ unfamiliarity with the cognitive backdrop of self-regulation is likely impacted by their lack of instruction on metacognitive processes while students in school and as pre-service teachers.

**In what ways do teachers self-regulate for their own professional growth purposes?**

Research Question number two included two themes. The first, *teachers’ growth strategies*, explored how participants attempted to grow professionally on a daily basis, or informally. Relevant sub-themes included: focus of improvement, reflecting to improve, seeking information to improve, and reflections on overall growth. Participants exhibited signs of using self-regulation strategies in their professional growth. Participants discussed when they started reflecting, the timing of reflections, and what triggers them to reflect. For example, Aubrey discussed student teaching as the time when she learned to reflect on her instruction, “I, really in student teaching… I think student teaching is probably when I first started thinking about, kind of reflecting and self-evaluation.” While Claire mentioned trying to do a journal reflection weekly, “my goal is to try and journal about once a week of how I do.”

Participants’ descriptions of progressing through formal professional development events informed the second theme *self-regulating professional development*. Two relevant sub-themes emerged: self-regulation not present and self-regulation present. Participants described a propensity to self-regulate while involved with formal professional development events if the event was deemed meaningful and useful to them. A key factor was immediacy, when something was quickly and easily implemented in their programs, participants were motivated to learn and described ways of self-regulating. As a representative feeling among participants, Aubrey discussed a formal professional development event that did not provide usefulness and immediacy, “it would have been a great book for somebody in college that was going into education, [but] we did that after we have been teaching [for years].” Additionally, what drove teachers to attend formal professional development events varied among participants, some sought content in order to engage their students, and others sought instructional strategies to enhance student engagement.

When informally seeking to improve their abilities as educators on a day-to-day basis, participants described utilizing reflection often as a means for improvement. How participants learned their reflection processes varied, as Brad and Aubrey cited their time in student teaching. Brad described his early reflecting activities with his cooperating teacher, “you sit down and talk with your cooperating teacher. Okay, what [do] you think went well, what didn't go so well, what can we do to improve… what are we going to do tomorrow?” What triggered the informal reflections varied, but included seeing novice teachers teach, seeing a speaker during a formal professional development event, and also attempting to reflect on a daily basis.

Participants described actions that reflect progression through the Zimmerman and Campillo (2003) self-regulation model by making evaluation part of their reflections. When describing reflection strategies, Doug pretends he is being observed by administrators to help him evaluate his effectiveness, “I always try to visualize somebody is watching me, so that way I can always stay professional and don't get too loose.” One similarity between participants was basing at least part of their evaluations on their students, as Brad highlights, “maybe students weren’t engaged or I don't think they are really getting [it].”

Once evaluations were made during informal professional growth, participants implied cycling back into the first phase of the self-regulation model, the Forethought Phase, by taking steps to improve that lesson in the future. Claire brainstormed solutions and/or set new goals for
herself to make the decided improvements, while Brad looked to what his goal was, and where he wanted to be, when planning to move forward. Aubrey described a more explicit process when completing the model and continuing back into the Forethought Phase by taking immediate steps once she assesses a problem, “I don't do that next year. I throw it away, or delete something off my computer, I fix it, like, right then.”

Similar to informal professional growth strategies, when discussing formal professional development events participants again frequently described actions that reflect utilizing SRL processes. In order for participants to employ self-regulation strategies during formal professional development events, they cited the need for the learning to be deemed valuable and easily accessible for immediate use in their classrooms, as Brad shared “I want to be able to take something back that I can use relatively easily, within my classroom, fairly quickly.” They illuminated entering a new professional development event relying heavily on the Forethought Phase of the self-regulation model, and then if their motivational needs were met, they continued to proceed throughout the three phases while undergoing the professional development. Doug demonstrated this while sharing a process similar to Brad’s, “the first thing I was thinking was how can I use this…Then I think about later how I can use it, teach [it] that is.”

Another highlight of focusing on the Forethought Phase (seeking value or need for the learning) is illustrated by Claire, who suggested her need to do, “something that makes it relevant for me is doing. If I am doing the experiment they are talking about.” When describing actions that suggested proceeding through the second and third phases, participants cited how they constantly monitor the new information and reflect on where they could utilize it in their programs, as Claire stated, “I look more at, like, ways that I can help those individual students, or to kind of, like, a group of students that are all similar.” In slight contrast, Brad discussed how he takes a total program view while undergoing professional development, “how does it fit my overall program, I look at it from a program perspective of, okay, where is this, where can I put this…Is it an animal science thing…is it agriculture science, or veterinary science.”

What strategies do teachers use to foster self-regulation in their students?

Participants’ disproportionate attribution of self-regulation to behavior informed the theme relevant to Research Question three, application of self-regulation, which explored how participants attempted to facilitate SRL with their students and included sub-themes: structuring instruction based on personal preferences, fostering growth, and self-regulation absent from instructional planning. It was common for participants to focus on student motivation while discussing working with students, as representatively Brad suggested “sometimes it’s just a kid that is, you know, it’s an effort thing, or it’s an attitude thing, so you talk to them.” As a result, there appeared to be a disconnect between practitioners’ use of self-regulation and their attempts to facilitate those processes within their students, so even though students may become self-efficacious and motivated they still may not know how to utilize the processes in the second and third phases of the self-regulation model.

In contrast to previously discussed findings suggesting the participants utilized self-regulation for their own growth, they described a potential incomplete understanding of self-regulation when discussing how they attempted to facilitate growth in their students. Participants highlighted growth strategies that mostly targeted student motivation, and more specifically student outward actions, when they had a student who was struggling. Doug described how he seeks to improve motivation by working one-on-one, “I'll put in extra time after school, I mean it's in the morning, get them to come in, just kind of, I hate to say it, just do one-on-one work with them.” Claire discussed the need for a relationship with students in order to foster motivation and effort,
“trying to build relationships with them. Because they are not going to perform for me, or grow, they aren’t going to put forth that effort unless they respect me.”

The focus on the first phase of the SRL model, and specifically on observable behaviors of students, could be influenced by participants’ propensity to structure their instruction based on their own feelings toward learning, value attribution, and learning preferences. Aubrey discussed liking creativity as a learner, therefore she tries “to give kids as many opportunities to be creative” as she can. Claire described similar patterns, suggesting she recognizes learners who are similar to herself, and that influences her instruction, “the first step is noticing that students either aren't getting it or that they seem bored. And I think some of that comes from, like, back when I was a student I hated to be bored.”

Participants reflected how their failures were a result of lack of effort and discussed their assumptions that when students failed it is because they lacked the necessary motivation. For example, Doug described how he tries to transfer his own thoughts toward learning to his students, “whatever you want to put your mind to, is what you can accomplish. And I believe that, and that’s what I try to portray to my kids.” He also discussed how his own beliefs impact his expectations of students, “it seems so simple to have some drive and to have some goals.” These descriptions culminated with participants describing attempts to facilitate SRL processes by emphasizing the first phase of the self-regulation model. A possible negative impact of being concerned with observable student behaviors and motivation is teachers are potentially neglecting the second (performance) and third (self-reflection) phases of the model, even though they describe utilizing those processes for their own personal growth.

Conclusions

While teachers discussed actions that suggested they used SRL strategies subconsciously as students and later discussed thinking more explicitly about their own learning when they started teaching, specifically focusing on the Forethought Phase of the Zimmerman and Campillo (2003) model, their descriptions of their actions were less focused on underlying self-regulation processes and more focused on the actual physical manifestation (doing) of the strategy. Teachers were also less likely to describe characteristics from the second and third phases of the self-regulation model presented by Zimmerman and Campillo (2003), this is likely due to a lack of formal training in self-regulation strategies contributing to teachers’ possible incomplete understanding of the cognitions required for self-regulation.

Participants’ own need for motivation may have bearing on their own meaning attributions of self-regulation. While participants discussed utilizing SRL processes such as seeking assistance, self-evaluation, and self-monitoring, their descriptions often highlighted a lack of formal understanding of the cognitions underlying these processes. They disproportionately attributed meaning to effort or behavior, with their students and themselves. Self-regulated learning exercises could teach educators to recognize internal cognitions involved as well as how to make their thinking strategies more “visible” to their students and make connections to the Zimmerman and Campillo (2003) model of SRL. This is an important step, as teachers’ proclivity to utilize SRL processes in their own growth suggests they could become an integral model for helping students develop thinking skills.

The attention placed on motivation was further illustrated by participants alluding to what students were physically doing when they described a self-regulated learner, and the focus on doing led them to attempt to foster growth in self-regulation through behavior rather than cognitions. Aligning with the focus on behavior, when planning instruction, teacher discussions also commonly
focused on teacher actions or student activities, and less how teachers plan to encourage student thinking and reflection. Developing a deeper understanding of motivation could impact how teachers make meaning of self-regulation and how they attempt to foster growth within their students.

Research has shown the importance of metacognition and its related processes, as the National Research Council (2000) discussed in *How People Learn* “experts’ abilities to reason and solve problems depend on well-organized knowledge…” (p. 48), and “knowledge of a large set of disconnected facts is not sufficient…must have opportunities to learn with understanding” (National Research Council, 2000, p. 16). Participants described utilizing SRL to develop organized knowledge, whether in relation to pedagogy or content, and represent a possible avenue for modeling SRL behaviors for students. Self-regulation processes can assist learners with connecting new knowledge, allowing them to become experts in fields they are studying.

Reflecting on our own thinking as educators may provide inroads toward developing a more well-rounded view of self-regulation and metacognition, helping to connect the three phases of the SRL model. While teachers explained employing self-regulatory strategies for their own growth, they did not appear to consistently transfer their own skills to situations involving student use of such strategies. Efforts seeking to improve metacognitive process understanding among teachers should have the end goal in mind: transferring comprehension and the use of these processes from teachers to their students.

Teachers’ making their thinking visible is one way to attempt transfer, as the National Research Council (2000) explained “in research with experts who were asked to verbalize their thinking as they worked, it was revealed that they monitored their own understanding carefully, making note of when additional information was required for understanding” (p.18). While the present study examined experts and how they think about learning, making internal cognitions visible to students may impact students’ understanding and adoption of metacognitive and/or self-regulation processes. Teachers making their thinking visible and becoming a model self-regulated learner could be powerful, as a key component of their reflections was the ability to self-evaluate and self-monitor at proficient levels. This was achieved through different means, such as painting a mental image of how a lesson should go and then comparing reality to that image, or constantly monitoring student engagement and performance – this indicates use of the Performance Phase (self-observation) of the self-regulation model (Zimmerman & Campillo, 2003). These steps may be crucial, as students may be unaware of metacognitive process usage by teachers unless those processes are verbalized (National Research Council, 2000). As a result, even though participants described employing SRL processes and strategies, it is likely their students are unaware of those strategies and their benefits.

**Implications**

A possible direction for teacher education to take in order to increase the formalized knowledge of SRL by teachers is incorporating an intentional focus on SRL during preservice education. Self-regulated learning instruction is important, because, as discussed previously in findings, participants described not receiving instruction in SRL strategies, as Claire highlighted any instruction was mainly focused on goal setting, “I don’t know [about] receiving training [self-regulation]…I would say [mainly] setting goals.” SRL could be intertwined with existing microteaching and reflection experiences that undergraduates undergo as part of their baccalaureate programs. Optimal implementation would incorporate SRL into all microteaching experiences, with early experiences focused on preservice teacher use of SRL and later experiences focused on preservice teacher facilitation of SRL. Explicit incorporation of SRL into teacher education could
potentially satisfy the argument made by the National Research Council (2000), helping teachers make their thinking visible to students.

Infusion of SRL into microteaching experiences would revolve around the SRL model presented by Zimmerman and Campillo (2003): the Forethought Phase, the Performance Phase, and the Reflection Phase. Earlier microteaching experience would need to be comprised of a focus on the Forethought Phase of the SRL model. The teacher-educator would lead preservice teachers through planning activities that challenge them to think about their lessons as they prepare to teach them. After debriefing preservice teachers’ thoughts, the teacher-educator would then lead instruction that ties the planning activity back to the Forethought Phase of the SRL model, wrapping up with examples of possible self-monitoring activities preservice teachers can employ during the act of teaching their lessons (Performance Phase). After the microteaching experience, preservice teachers would then be challenged to reflect on their experience utilizing ideas developed during their planning session and data gathered through their own self-monitoring. The discussion would be tied back to the SRL model, specifically focusing on the reflection phase and underlying principles.

Later microteaching experience should then focus on preservice teacher facilitation of SRL with students. Following a similar structure, teacher-educators would lead preservice teachers in the development of a lesson plan that incorporates the three phases of the SRL model. The preservice teacher should be challenged to apply the concept of SRL by providing opportunities for their students to have meaningful forethought, performance, and reflection during their lesson. This aspect could help teachers move beyond the focus on physical, outward behavior of students and require them to focus on the internal cognitions of students. An even further step that could have an impact on teacher awareness and facilitation of SRL is incorporating training for cooperating teachers. Training focused on SRL could assist cooperating teachers with structuring their discussions with their student-teacher around the SRL model. Such discussions could further encourage the student-teacher to consider not only their own development, but also their students’ cognitive development while reflecting on lessons.

Recommendations

While this exploratory study did not engage in the final stage of the Glaser (1965) process – theory development – future research should build on the rich data collected here by seeking to develop a deeper understanding of agriculture teachers’ perspectives of SRL through additional modes of data collection including observations of teacher strategies during instruction. A broader study could contribute to theory development in the field of agricultural education as it relates to SRL. Possible research paths for SRL in agricultural education are further discussed in this section.

Findings suggest participants formed an incomplete understanding of self-regulation. This incomplete understanding potentially impacted how they tried to facilitate self-regulation processes. These new findings can inform future research to explore self-regulation instructional strategies holding promise for teaching teachers and students to utilize self-regulation cognitive strategies. While there exists a body of evidence suggesting self-regulation is an important component of achievement, and participants in this study described using self-regulation for their own growth, future research is needed concerning the development of self-regulation instruction for teachers and strategies to facilitate self-regulation within students.

Future exploration concerning self-regulation and other forms of metacognition can incorporate several approaches, two of which include focusing on teachers’ acquisition of the cognitions needed for self-regulation, and the other focusing on students’ acquisition of self-
regulation processes. A crucial step in research involves investigating strategies that hold promise for increasing educators’ formal knowledge and comprehension of underlying cognitions required for self-regulation to occur. Reducing the divide between teachers’ personal utilization and their apparent incomplete understanding of facilitating self-regulation processes could advance the field of agricultural education toward finding effective ways to facilitate these processes with students. Other possible research includes exploring how instruction in self-regulation processes impacts teachers’ attitudes toward the teaching profession, their facilitation of those processes in the classroom, and their future professional development experiences.

Future research should focus on the student impact of self-regulation facilitated instruction. Research might explore which facilitation strategies employed by teachers hold the most promise in increasing students’ use of self-regulation processes. How self-regulation instruction impacts student academic achievement, interest in agriculture, motivation to learn, and career aspirations should also be examined. The final research recommendation would be to explore the student transfer of self-regulation strategies to other classes. In order for transfer to take place more often, information needs to be organized into a conceptual framework that allows students “to apply what was learned in new situations and to learn related information more quickly” (National Research Council, 2000, p. 17). Educators should strive to not only produce transfer of subject knowledge, but also the skills related to the process of learning as well.

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U.S. Adults with Agricultural Experience Report More Genetic Engineering Familiarity than Those Without

Kathryn A. Stofer1 & Tracee M. Schiebel2

Abstract

Researchers and pollsters still debate the acceptance of genetic engineering technology among U.S. adults, and continue to assess their knowledge as part of this research. While decision-making may not rely entirely on knowledge, querying opinions and perceptions relies on public understanding of genetic engineering terms. Experience with agriculture may increase familiarity with genetic engineering terms. We conducted a national survey of 429 United States adults through Qualtrics and found two-thirds lack any formal, nonformal, or informal agriculture experience. More than half of participants knew “a little” or less for 13 of the 17 terms presented, especially those directly related to genetic engineering or breeding technology for food, such as “genetically modified organism” and “crossbred organism.” Consumers with agricultural experience reported more term familiarity for genetics and genetic engineering than those without experience. More than half also felt they did not know the difference between traditional selective breeding, DNA-directed breeding, and genetic engineering, but they still felt both human health and environmental risks should be considered before creating new animal or plant varieties. We must consider the lack of familiarity of genetic related terms and experience in agriculture when researching or creating educational programming around genetic engineering for food.

Keywords: genetic engineering; public understanding of science; agricultural experience; genetically modified organism; term familiarity

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Introduction

Consumers are more aware of and interested in the agricultural industry as agriculturalists meet new demands of feeding a growing population (Anderson, Ruth, & Rumble, 2014). At the same time, only 2% of Americans live on farms and directly experience agriculture, a rate much lower than in the mid-20th century (Environmental Protection Agency, 2013). By another measure, if involvement in high school agriculture is the standard for agricultural experience (Duncan, Carter, Fuhrman, & Rucker, 2015; Dyer, Breja, & Wittler, 2002; Esters, 2007), then only 6% of younger adults in the U.S. are likely to have any direct agricultural experience. Estimates suggest at most one million high school students are involved in FFA (National FFA Organization, 2013) out of over 15 million public high school students in the U.S. (National Center for Education Statistics, n.d.).

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Agriculturalists and scientists work together to determine agricultural needs and potential scientific solutions, pairing the scientific and agricultural communities and industries. Overall, science as a field enjoys broad support from adults in the United States (Pew Research Center, 2015), while support for agriculture may be much lower (Lundy, Ruth, Telg, & Irani, 2006; Pilger, 2015; Wachenheim & Rathge, 2000). Americans may also see agriculture and science differently than scientists do, as more separate than intrinsically linked (Stofer & Newberry III, 2017). Particularly for agribiotechnology, Americans may not trust the underlying science as much as they do in other domains (Blaine, Kamaldeen, & Powell, 2002; McHughen, 2007; Moon & Balasubramanian, 2004).

One such agribiotechnology which scientists support (Chassy, 2007) but the public may not is genetic modification and genetic engineering (GE). Such technology allows for the manipulation of genes to produce a desired trait, creating improvements in growth rate, disease and insect resistance, and nutritional value. Although genetic engineering has been around for several decades, national polls and evaluation studies of United States adults indicate many may still be unsure of the risks and benefits of genetic engineering specifically for food production and may not accept the use of this agricultural technology (Evans & Ballen, 2016; Hallman, Cuite, & Morin, 2013; Traill et al., 2006). Indeed U.S. adults may be far apart from scientific consensus on the issue of safety for human consumption (Pew Research Center, 2015). However, these national studies also treat GE technology as a single issue, rather than a set of related cases for individual crops and the improvements targeted. For example, perceptions of risks and benefits of GE to save a rapidly declining citrus crop in the exigent case may be different from a discussion of fortifying rice with beta-carotene for better nutrition in under-resourced areas.

However, others suggest that genetically engineered foods are not controversial in the United States, both because the aforementioned surveys are invalid and because consumers buy GE foods despite their poll answers (Kahan, 2015). None of these non-peer-reviewed data sources actually considers whether consumers know what GE involves for food, nor specifically examine human health versus environmental risk perception (Stofer & Schiebel, 2017). As people may prefer phenomena with which they are familiar (Zajonc, 2001), lack of exposure to these terms may be another reason people indicate low acceptance of a technology when asked. If research participants lack familiarity with specialized terminology used to determine opinions, researchers will not be able to determine consumers’ true feelings toward the technology (Sturgis & Allum, 2004; Sturgis, Brunton-Smith, & Fife-Schaw, 2010; Wynne, 2006).

We have few recent, national peer-reviewed studies suggesting consumers actually know what genetic engineering technology for food involves, the differences in human health and environmental risks, let alone whether they support its use in general or specific cases (Stofer & Schiebel, 2017). Indeed, a single national evaluation report (Hallman et al., 2013) and one peer-reviewed study (Abrams, McBride, Hooker, Cappella, & Koehly, 2015) suggest U.S. adults may not be completely aware of or clear on the meaning of genetic engineering technology, and thus they are unable to validly respond to research soliciting opinions on whether to support the use of the technology. Related research on consumer opinions of another emerging technology, nanotechnology, suggests that once consumers do become more informed, they may become polarized on the issues of risk based on cultural associations, rather than knowledge (Kahan, Braman, Slovic, Gastil, & Cohen, 2009). Current research in agricultural education on biotechnology attitudes (Ruth, Rumble, Gay, & Rodriguez, 2016; Wingenbach, Rutherford, & Dunsford, 2003) may focus on undergraduates and often undergraduates at land-grant institutions, which may not be representative of the U.S. population as a whole.
Genetic engineering brings a new list of associated vocabulary and jargon that researchers have used without definitions in surveys and focus groups when studying GE technology and food (Stofer & Schiebel, 2017). Determining the public’s awareness of terms frequently used with the technology and determining their experience in agriculture can help GE researchers and marketers understand consumers’ concerns about the technology especially as it relates to food production. Understanding the public’s broader literacy about genetics also interests the American Association for Agricultural Education (AAAE). Priority 1 of the National Research Agenda focuses on public and policy maker understanding of agriculture and natural resources (Enns, Martin, & Spielmaker, 2016). Combining understanding of the public’s term familiarity, actual perceptions of genetic engineering when research participants understand the technology and terms, and experience in agriculture can guide researchers and practitioners in designing information and outreach programming aimed at building understanding and acceptance of GE technology in food.

The purpose of this study was first to determine the United States adult population’s level of term familiarity about genetics specifically related to plants and livestock, genetically modified organisms, genetic engineering, and the context of food. Next, we sought to determine the U.S. adult population’s self-perceptions of genetic engineering through a series of questions on risk, regulation and the differences between production techniques. Finally, we determined participants’ experience in agriculture and considered whether term familiarity, perceptions of GE technology, and experience in agriculture were related.

### Conceptual Framework

Understanding familiarity is an essential step to determining overall literacy about and acceptance of a particular subject for an individual or group. E.M. Rogers’ (2003) Diffusion of Innovation model offers a process for adopting new information with a hierarchy of knowledge encompassing a three-step process to understanding information. The three steps to increasingly complex knowledge are awareness knowledge, how-to knowledge, and principles knowledge. Abrams et al. (2015) recommended that researchers using Roger’s hierarchy of knowledge measure these types of knowledge independent of each other, analyzing each component on its own. In this study, we chose to assess awareness knowledge through term familiarity. Term familiarity shows understanding of a particular concept. Researching awareness through familiarity is a critical first step before researching opinion and perception. If a participant is unfamiliar with a term, they will be unable to give their informed opinion of that concept.

Term familiarity also indicates an individual’s exposure to a particular item. Researchers studying a variety of contexts, stimuli, and audiences have found people prefer the familiar (Zajonc, 2001). Exposure to a specific phenomenon and frequency of exposure creates a comfort level and stronger preference as well as a higher familiarity rating. Term familiarity in the area of genetics and GE technology may relate to an individual’s experience with the particular term or subject, and may influence preference for a new technology such as lab-based genetic engineering. Understanding terminology and establishing awareness is a critical first step before researchers can accurately determine consumer preferences without having to define terms in each research instrument. Therefore, we undertook this study in the context of assessing awareness knowledge and term familiarity.

### Purpose and Objectives

The purpose of this study was to understand U.S. adults’ familiarity with terms related to genetic engineering for food and traditional and DNA-directed selective breeding technologies, perceptions of these technologies, and the influence of experience in agriculture on term familiarity.
and perceptions of these technologies in order to inform future research on consumer preferences and education on biotechnology. Specifically, our objectives were to:

1. Determine the United States adult population’s level of term familiarity in the realm of genetics, specifically related to genetically modified organisms and genetic engineering in the context of food.
2. Determine the United States adult population’s perceptions of GE technology for food, specifically including perceptions of health and environmental risk.
3. Assess adult public experience with agriculture.
4. Compare relationships among term familiarity, perceptions of GE technology for food and experience in agriculture.

Methods

We surveyed a national sample of United States adults through Qualtrics, a survey software company, in August 2016. Qualtrics gathered responses through an opt-in panel of users who signed up for the company’s survey pool, meaning not everyone in the population of U.S. adults had an equal probability of selection. A large sample size, however, is intended to compensate for non-probability research (Ary, Jacobs, Sorensen, & Walker, 2014). We used a gender and age quota to ensure demographic breakdown reflected the latest Census population distribution (U.S. Census Bureau, 2014) (see Table 1. Matching the U.S. census allowed us to be confident that the sample is representative of the population by gender and age. Therefore, we did not conduct explicit non-response bias testing nor use weighting based on demographics after the fact. We screened out participants using automatic checks in Qualtrics for time spent on each page of the survey as a measure of diligence. We also removed participants who typed gibberish or left blank three short-answer open-ended questions. Qualtrics offered the participants compensation for completing the 30-minute survey of which these questions were part. The [University] IRB approved this study.

Table 1

<table>
<thead>
<tr>
<th>Age</th>
<th>Male n (%)</th>
<th>Female n (%)</th>
<th>Other n (%)</th>
<th>Prefer not to answer n (%)</th>
<th>Experience in agriculture</th>
</tr>
</thead>
<tbody>
<tr>
<td>18-24 years</td>
<td>18 (4)</td>
<td>28 (7)</td>
<td>5 (1)</td>
<td>0 (0)</td>
<td>35 (8)</td>
</tr>
<tr>
<td>25-44 years</td>
<td>66 (15)</td>
<td>76 (18)</td>
<td>4 (1)</td>
<td>1 (0)</td>
<td>86 (20)</td>
</tr>
<tr>
<td>45-64 years</td>
<td>75 (17)</td>
<td>77 (18)</td>
<td>3 (1)</td>
<td>0 (0)</td>
<td>107 (25)</td>
</tr>
<tr>
<td>65 years +</td>
<td>39 (9)</td>
<td>36 (8)</td>
<td>0 (0)</td>
<td>1 (0)</td>
<td>54 (13)</td>
</tr>
<tr>
<td>Total</td>
<td>198 (46)</td>
<td>217 (51)</td>
<td>12 (3)</td>
<td>2 (0)</td>
<td>282 (66)</td>
</tr>
</tbody>
</table>

We determined term familiarity relating to genetic literacy using a self-report on a seven-point Likert-type scale, with labels ranging from 1 - I’ve never heard of this, to 4 – I know a little about this, to 7 – I am an expert in this and can teach others. See full set of labels in Table 2. Defining each number on the scale allowed participants to appropriately rank their familiarity and understand the meaning of each scale point. Participants responded to 17 terms, the first eight of
them matching the terms asked previously in the one national peer-reviewed study we found (Abrams et al., 2015): genetic, chromosome, susceptibility, mutation, variation, abnormality, heredity and sporadic. The Abrams et al. scale did not include genetic engineering or plant- or livestock-breeding terms.

Therefore, the authors in consultation with an expert panel for construct validity, added nine additional terms specifically related to genetic engineering, genetically modified organisms, and selective breeding. Table 2 lists all the terms used for the study. The next set of questions asked the participants if they knew the difference between breeding and GE techniques, and their perceptions of the risks to health and environment for genetic engineering. Participants responded to six statements using a five-point Likert-type scale ranging from strongly disagree through strongly agree; see Table 3. Finally, to determine experience in agriculture, we asked participants to self-report aspects of their previous or current experience in agriculture. We listed several components of agriculture experience including taking classes in agriculture, having plant or animal experience, and production agriculture experience, to cover both formal and non-formal or free-choice learning experience (Stofer, 2015). See Table 4. Each of these sets of questions were in the first part of a larger survey including science literacy items, worldview items, and free-response items about definitions of GE terms. We did not examine these later literacy, worldview, and definitions items in this paper.

Analysis

We averaged term familiarity for individual items and averaged those item scores into a total familiarity score for each participant ("all familiarity terms"), as well as sub-scores for the terms previously studied by Abrams et al. (2015) ("Abrams terms"), and the new terms chosen for this study ("researcher-driven terms"). The Abrams terms scale had Cronbach’s alpha .86, while the researcher-driven terms scale had Cronbach’s alpha .98, and the combined scale of 17 terms had a Cronbach’s alpha of .93, indicating acceptable reliability (Ary et al., 2014).

We grouped participants who indicated any type of experience with agriculture (see Table 4) and compared their term familiarity scores with those of participants who indicated no experience with agriculture using independent two-sample t-tests using SPSS. We also compared familiarity with terms from Abrams et al. (2015) between participant groups, as well as familiarity with just the nine terms we prepared for our survey specifically related to genetic engineering. Finally, we conducted Pearson’s correlation analysis of familiarity scores averaged for the researcher-driven terms with self-perception of difference between GE technology and breeding techniques.

We calculated Cohen’s d for effect size for the overall familiarity scale versus groups with or without agriculture experience using an online effect-size calculator (Becker, 1999). Cohen’s d was 0.49, with an effect size of 0.24. An effect size of 0.2 is a small effect (Cohen, 1992). We used GPower 3.1.9.2 software for Mac to compute power with this effect size. At alpha .05, our sample size gave us a power of 0.65, suggesting a 35% chance of missing an effect. Therefore we relaxed our alpha to .10, resulting in a power of 0.76 and only a 24% chance of missing an existing small effect size.

Results

We collected a total of 429 responses for familiarity and experience and 423 total responses for questions relating to GE technology perceptions, as we eliminated six participants who did not complete the full set of GE technology perceptions questions. Our respondents’ highest level of
educational attainment was somewhat higher than the nation as a whole. Almost all of our participants reported earning at least a high school diploma or equivalent (99.3%), compared to census reports of attainment at this level for 88% of U.S. adults over the age of 25 in 2015. However, rates of bachelor’s- (30%) and higher-degree attainment (13%) were similar to census reports.

Our first goal was to determine the United States adult population’s level of term familiarity in the realm of genetics, specifically related to genetically modified organisms and genetic engineering. Out of 17 terms, heredity (7%), followed by abnormality (4%) and variation (3.5%), had the largest number of responses I am an expert in this and can teach others (7), where participants felt that they knew the most about those genetic-related terms. All other terms had 3% or fewer respondents indicating expert-level knowledge of the term. Only four out of the 17 terms had more than half of the population responding that they know a fair amount (5) and above: genetic (54.3%), mutation (52%), abnormality (57.1%) and heredity (65.3%). None of the terms the researchers added for this survey scored 5 or more with a majority of respondents. Additionally, 15% or more of the respondents scored many of the terms in the survey I’ve never heard of this (1) or I’ve heard of this, but don’t really know what it is (2): susceptibility (20.7%) and sporadic (18.7%) from the Abrams terms and all of the researcher-driven terms except genetically modified organism (15.2%). Three researcher-driven terms were highly unfamiliar (scoring 1 or 2) to almost 30% of respondents: crossbred food (27.5%), hybrid organism (24.3%) and hybrid food (28%) (see Table 2). Individual terms’ average familiarity scores ranged from 3.54 out of 7 for crossbred food to 5.54 for heredity. The overall average term familiarity score was 4.5, fitting right between (4) I know a little about this and (5) I know a fair amount about this (see Table 5).

The second objective was to determine the United States adult population’s perceptions of GE technology for food. When it came to knowing the difference among 1) traditional selective plant or animal breeding, 2) selective breeding supplemented with DNA test information to inform breeding choices, and 3) genetic engineering or transgenic programs, 48% of participants agreed or strongly agreed that they did not know the difference (see Table 3). Less than half (38.3%) of participants agreed or strongly agreed that they believe that modern technologies are not meaningfully different and not more risky in any important way than traditional selective breeding. More than half (59.6%) agreed or strongly agreed that human health is the main risk to consider when deciding on new varieties for human consumption and there is no cause for alarm if the varieties do not cause disease in people. However, nearly two-thirds of participants (71.9%) agreed or strongly agreed that environmental impacts are important to consider not only because they could impact human health but also because the environment is important on its own.

Next we investigated participants’ experience with agriculture. Nearly two-thirds of participants (66%) reported no experience in agriculture. However, the percentage of participants reporting any experience with agriculture varied with age. The middle two age groups (25-44 and 45-64) had higher levels (14% and 11%) of participants with experience in agriculture than the youngest (18-24, 4%) and oldest (65+, 5%) participants (see Table 1). The 34% of participants with experience indicated varying types of experience in agriculture, including work, classes, and other agricultural experience. Only 2% reported work in genetic engineering specifically (see Table 4).
Table 2

Level of Familiarity with Terms Related to Genetic Engineering

<table>
<thead>
<tr>
<th>Term</th>
<th>1 – I’ve never heard of this</th>
<th>2 – I’ve heard of this, but don’t really know what it is</th>
<th>3 – I know basically what this is but not much about it</th>
<th>4 – I know a little about this</th>
<th>5 – I know a fair amount about this</th>
<th>6 – I know a lot about this</th>
<th>7 – I am an expert in this and can teach others</th>
</tr>
</thead>
<tbody>
<tr>
<td>n (%)</td>
<td>n (%)</td>
<td>n (%)</td>
<td>n (%)</td>
<td>n (%)</td>
<td>n (%)</td>
<td>n (%)</td>
<td>n (%)</td>
</tr>
<tr>
<td>Genetic</td>
<td>4 (0.9)</td>
<td>21 (4.9)</td>
<td>78 (18.2)</td>
<td>93 (21.7)</td>
<td>141 (32.9)</td>
<td>79 (18.4)</td>
<td>13 (3)</td>
</tr>
<tr>
<td>Chromosome</td>
<td>12 (2.8)</td>
<td>25 (5.8)</td>
<td>75 (17.5)</td>
<td>104 (24.2)</td>
<td>141 (32.9)</td>
<td>63 (14.7)</td>
<td>9 (2.1)</td>
</tr>
<tr>
<td>Susceptibility</td>
<td>37 (8.6)</td>
<td>52 (12.1)</td>
<td>73 (17.0)</td>
<td>95 (22.1)</td>
<td>104 (24.2)</td>
<td>62 (14.5)</td>
<td>6 (1.4)</td>
</tr>
<tr>
<td>Mutation</td>
<td>5 (1.2)</td>
<td>28 (6.5)</td>
<td>65 (15.2)</td>
<td>108 (25.2)</td>
<td>138 (32.2)</td>
<td>72 (16.8)</td>
<td>13 (3.0)</td>
</tr>
<tr>
<td>Variation</td>
<td>18 (4.2)</td>
<td>28 (6.5)</td>
<td>74 (17.2)</td>
<td>107 (24.9)</td>
<td>118 (27.5)</td>
<td>69 (16.1)</td>
<td>15 (3.5)</td>
</tr>
<tr>
<td>Abnormality</td>
<td>8 (1.9)</td>
<td>14 (3.3)</td>
<td>63 (14.7)</td>
<td>99 (23.1)</td>
<td>136 (31.7)</td>
<td>92 (21.4)</td>
<td>17 (4.0)</td>
</tr>
<tr>
<td>Heredity</td>
<td>9 (2.1)</td>
<td>10 (2.3)</td>
<td>50 (11.7)</td>
<td>80 (18.6)</td>
<td>151 (35.2)</td>
<td>99 (23.1)</td>
<td>30 (7.0)</td>
</tr>
<tr>
<td>Sporadic</td>
<td>41 (9.6)</td>
<td>39 (9.1)</td>
<td>76 (17.7)</td>
<td>96 (22.4)</td>
<td>100 (23.3)</td>
<td>67 (15.6)</td>
<td>10 (2.3)</td>
</tr>
<tr>
<td>Genetically engineered organism</td>
<td>24 (5.6)</td>
<td>51 (11.9)</td>
<td>78 (18.2)</td>
<td>95 (22.1)</td>
<td>114 (26.6)</td>
<td>59 (13.8)</td>
<td>8 (1.9)</td>
</tr>
<tr>
<td>Genetically engineered food</td>
<td>24 (5.6)</td>
<td>44 (10.3)</td>
<td>71 (16.6)</td>
<td>103 (24.0)</td>
<td>114 (26.6)</td>
<td>66 (15.4)</td>
<td>7 (1.6)</td>
</tr>
<tr>
<td>Crossbred food</td>
<td>67 (15.6)</td>
<td>51 (11.9)</td>
<td>83 (19.3)</td>
<td>99 (23.1)</td>
<td>76 (17.7)</td>
<td>47 (11.0)</td>
<td>6 (1.4)</td>
</tr>
<tr>
<td>Genetically modified organism</td>
<td>23 (5.4)</td>
<td>42 (9.8)</td>
<td>86 (20.0)</td>
<td>108 (25.2)</td>
<td>101 (23.5)</td>
<td>61 (14.2)</td>
<td>8 (1.9)</td>
</tr>
<tr>
<td>Genetically modified food</td>
<td>20 (4.7)</td>
<td>44 (10.3)</td>
<td>79 (18.4)</td>
<td>106 (24.7)</td>
<td>115 (26.8)</td>
<td>54 (12.6)</td>
<td>11 (2.6)</td>
</tr>
<tr>
<td>Crossbred organism</td>
<td>59 (13.8)</td>
<td>45 (10.5)</td>
<td>81 (18.9)</td>
<td>101 (23.5)</td>
<td>89 (20.7)</td>
<td>46 (10.7)</td>
<td>8 (1.9)</td>
</tr>
<tr>
<td>Hybrid organism</td>
<td>56 (13.1)</td>
<td>57 (13.3)</td>
<td>79 (18.4)</td>
<td>96 (22.4)</td>
<td>80 (18.6)</td>
<td>49 (11.4)</td>
<td>11 (2.6)</td>
</tr>
<tr>
<td>Hybrid food</td>
<td>52 (12.1)</td>
<td>68 (15.9)</td>
<td>73 (17.0)</td>
<td>99 (23.1)</td>
<td>76 (17.7)</td>
<td>52 (12.1)</td>
<td>9 (2.1)</td>
</tr>
<tr>
<td>Selective plant breeding</td>
<td>54 (12.6)</td>
<td>49 (11.4)</td>
<td>78 (18.2)</td>
<td>110 (25.6)</td>
<td>47 (17.2)</td>
<td>55 (12.8)</td>
<td>9 (2.1)</td>
</tr>
</tbody>
</table>

a. Starting with *genetically engineered organism*, terms in the lower part of the table are the researcher-driven terms.
Table 3

Participant self-report of understanding and perceptions of risk (n = 423)

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly disagree (n(%)</th>
<th>Disagree (n(%)</th>
<th>Neither agree nor disagree (n(%)</th>
<th>Agree (n(%)</th>
<th>Strongly agree (n(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I don't really know the difference among 1) traditional selective plant or animal breeding, 2) selective breeding supplemented with DNA test information to inform breeding choices, and 3) genetic engineering or transgenic programs.</td>
<td>30(7.1)</td>
<td>101 (23.8)</td>
<td>89(20.9)</td>
<td>141 (33.2)</td>
<td>64(15.1)</td>
</tr>
<tr>
<td>I believe that traditional selective plant or animal breeding should be kept separate from the use of any modern technologies like DNA testing or genetic engineering/transgenics. These technologies increase the risk of ecological harm and give big companies too much control of food supplies and rural economies.</td>
<td>21(5.0)</td>
<td>58(13.7)</td>
<td>127(30.0)</td>
<td>163 (38.5)</td>
<td>57(13.5)</td>
</tr>
<tr>
<td>I believe that the use of DNA tests to help make decisions in selective breeding programs is very different from genetic engineering programs that directly manipulate/alter DNA of plants or animals. DNA test information can make breeding programs more effective without the risks involved with genetic engineering or transgenics.</td>
<td>9(2.1)</td>
<td>30(7.1)</td>
<td>152(35.9)</td>
<td>183 (43.3)</td>
<td>52(12.3)</td>
</tr>
<tr>
<td>I believe that all modern technologies like DNA testing within selective breeding programs or genetic engineering/transgenic programs are not meaningfully different from traditional selective plant breeding and are not more risky in any important way. We should use all tools at our disposal to try to improve the quantity and quality of plants and animals we use for food, fiber and fuel.</td>
<td>33(7.8)</td>
<td>81(19.1)</td>
<td>150(35.5)</td>
<td>128 (30.3)</td>
<td>34(8.0)</td>
</tr>
<tr>
<td>I believe that direct harm to human health is the main risk to consider when deciding whether to allow the creation of new varieties of plants or animals for human consumption. If these new varieties don’t cause diseases in people who eat them, then there is no cause for alarm.</td>
<td>21(5.0)</td>
<td>49(11.6)</td>
<td>104(24.6)</td>
<td>156 (36.9)</td>
<td>96(22.7)</td>
</tr>
<tr>
<td>I believe that the risk of harm to ecosystems, the health of other species, and the relationships among species is important to consider when we think about creating new varieties of plants or animals; these issues are important on their own and also because of possible indirect effects on human health.</td>
<td>10(2.4)</td>
<td>20(4.7)</td>
<td>92(21.7)</td>
<td>175 (41.4)</td>
<td>129 (30.5)</td>
</tr>
</tbody>
</table>
Table 4

*Previous or Current Experience in Agriculture*

<table>
<thead>
<tr>
<th>Answer choice</th>
<th>Participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>I have no experience in agriculture</td>
<td>282 (66%)</td>
</tr>
<tr>
<td>I have worked in food production and/or food processing</td>
<td>51 (12%)</td>
</tr>
<tr>
<td>I have taken classes in agriculture.</td>
<td>55 (13%)</td>
</tr>
<tr>
<td>I work/have worked in animal agriculture.</td>
<td>41 (10%)</td>
</tr>
<tr>
<td>I work/have worked in selective breeding.</td>
<td>14 (3.3%)</td>
</tr>
<tr>
<td>I work/have worked in animal agriculture.</td>
<td>68 (16%)</td>
</tr>
<tr>
<td>I feel that I am an informed consumer of agriculture.</td>
<td>92 (21%)</td>
</tr>
<tr>
<td>I work/have worked in genetic engineering.</td>
<td>10 (2%)</td>
</tr>
<tr>
<td>I work/have worked in plant agriculture.</td>
<td>31 (7%)</td>
</tr>
</tbody>
</table>

Table 5

*Term Familiarity Average Scores*

<table>
<thead>
<tr>
<th>Abrams Terms</th>
<th>M</th>
<th>SD</th>
<th>Researcher-driven terms</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Genetic</td>
<td>5.35</td>
<td>1.86</td>
<td>Genetically engineered organism</td>
<td>4.01</td>
<td>1.47</td>
</tr>
<tr>
<td>Chromosome</td>
<td>5.28</td>
<td>2.00</td>
<td>Genetically engineered food</td>
<td>4.08</td>
<td>1.45</td>
</tr>
<tr>
<td>Susceptibility</td>
<td>4.79</td>
<td>2.31</td>
<td>Crossbred food</td>
<td>3.54</td>
<td>1.62</td>
</tr>
<tr>
<td>Mutation</td>
<td>5.44</td>
<td>1.94</td>
<td>Genetically modified organism</td>
<td>4.02</td>
<td>1.43</td>
</tr>
<tr>
<td>Variation</td>
<td>5.27</td>
<td>2.11</td>
<td>Genetically modified food</td>
<td>4.07</td>
<td>1.42</td>
</tr>
<tr>
<td>Abnormality</td>
<td>5.52</td>
<td>1.84</td>
<td>Crossbred organism</td>
<td>3.67</td>
<td>1.60</td>
</tr>
<tr>
<td>Heredity</td>
<td>5.54</td>
<td>1.71</td>
<td>Hybrid organism</td>
<td>3.65</td>
<td>1.63</td>
</tr>
<tr>
<td>Sporadic</td>
<td>4.86</td>
<td>2.31</td>
<td>Hybrid food</td>
<td>3.63</td>
<td>1.62</td>
</tr>
<tr>
<td>Selective plant breeding</td>
<td></td>
<td></td>
<td></td>
<td>3.70</td>
<td>1.60</td>
</tr>
</tbody>
</table>

For Objective 4, we first investigated the relationship between term familiarity and agricultural experience. Averages for the overall term familiarity scale and both sub-scales were between 3.54 and 5.56 on the 1-7 scale for both experience groups. The group with agriculture experience consistently had a higher mean of familiarity than the group with no agriculture experience. Both experience groups reported less familiarity with the researcher-driven terms than the Abrams terms for both experience groups (see Table 6).
Table 6

*Familiarity Scores vs Agriculture Experience*

<table>
<thead>
<tr>
<th>Familiarity Terms</th>
<th>Experience</th>
<th>n</th>
<th>Mean</th>
<th>SD</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Familiarity Terms</td>
<td>No experience</td>
<td>281</td>
<td>4.28</td>
<td>1.50</td>
<td>.00</td>
</tr>
<tr>
<td>All Familiarity Terms</td>
<td>Experience</td>
<td>147</td>
<td>4.92</td>
<td>1.08</td>
<td>.00</td>
</tr>
<tr>
<td>Abrams Familiarity Terms</td>
<td>No experience</td>
<td>281</td>
<td>5.10</td>
<td>1.50</td>
<td>.00</td>
</tr>
<tr>
<td>Abrams Familiarity Terms</td>
<td>Experience</td>
<td>147</td>
<td>5.56</td>
<td>1.26</td>
<td>.00</td>
</tr>
<tr>
<td>Researcher-Driven Terms</td>
<td>No experience</td>
<td>281</td>
<td>3.54</td>
<td>1.39</td>
<td>.00</td>
</tr>
<tr>
<td>Researcher-Driven Terms</td>
<td>Experience</td>
<td>147</td>
<td>4.35</td>
<td>1.33</td>
<td>.00</td>
</tr>
</tbody>
</table>

*Note.* Participants could select any or all choices that applied.

The difference in average scores (0.64) between participants with experience and with no experience for all of the familiarity terms was significant (p < .01), and the difference between groups for Abrams’ terms (0.46) was also significant (p < .01). Lastly, the researcher driven terms had a mean difference of .80 between groups, but this difference was not significant, even at an alpha of .1 suggested by our power calculations.

We also investigated the relationship between term familiarity for the researcher-driven, GE-specific terms with self-report of understanding GE technology and breeding techniques. Overall term familiarity with researcher-driven terms was 3.84 (SD = 1.42, 1 to 7 scale) and self-report of GE technology understanding was 3.25 (SD = 1.18, 1 to 5 scale). Term familiarity and understanding of GE technology had a significant inverse relationship, with a Pearson correlation of -.49 (p < .05), just under the cutoff for a large effect size (Cohen, 1992).

**Discussion, Conclusions, Implications and Recommendations**

We first determined whether the U.S. public truly is familiar with GE technology terms in the context of food, due to conflicting results from polls and evaluations and a lack of peer-reviewed data. The current level of term familiarity with terms related to genetic engineering among United States adults in this study is low. When participants rated their level of familiarity of 17 terms, the majority of respondents reported knowing “little” or less (4 or lower on a 1 to 7 scale) on 13 terms, including all nine of the researcher-driven terms relating to genetic engineering and plant breeding specifically. Overall, average scores of familiarity of all terms was also 4.50, with no term averaging more than 5.54, or just between knowing a fair amount and knowing a lot about the term. High percentages (15 - 30%) of participant scores of 1 or 2 for many terms indicated a high degree of unfamiliarity for these terms, especially those on the researcher-driven subscale.

Next we assessed the perceptions of participants on their understanding of GE technology and its associated risks to both human and environmental health. Half of the participants were neutral or felt they did not know the difference between GE technology, laboratory-based selective breeding, and traditional selective breeding of plants and animals. Both low levels on term familiarity and understanding of GE versus breeding technologies are consistent with or higher than earlier evaluation and research (Abrams et al., 2015; Hallman et al., 2013). However, respondents agreed that human health risks were the most important to investigate when considering items for human consumption. They also felt environmental health was important, both for its indirect
impacts on human health as well as direct risks to the environment. Since we did not use unfamiliar terms, we are confident in the validity of these perceptions.

Our third aim in this study was to determine how many U.S. adults have experience with agriculture including formal secondary school experience, work experience, and other informal and nonformal experience. Self-reports of agriculture experience in our study indicated a higher estimate of people with experience, 34% of our sample, than traditional census samples reporting only those who currently work with agriculture (2%) or those who currently study agriculture in formal secondary school programs (6%). We also found differences in experience by age, with younger and older groups reporting smaller numbers of people with experience in agriculture than groups of 25-44 and 45-64 year olds.

Finally, we explored the relationships among experience with agriculture, term familiarity for GE technology in the context of food, and self-perception of GE technology understanding. First we confirmed that people with low term familiarity also reported low understanding of the differences between GE technologies and breeding techniques. A significant negative correlation for the relationship based on the wording of the questions confirmed that participants who were more familiar with specific terminology reported they understand better the difference between GE and breeding technologies. This correlation was just below the threshold (.5) for a large effect size. We also investigated experience versus term familiarity. Experience seems to play a role in familiarity with GE technology terms, though the effect sizes were small. Participants with experience in agriculture had significantly higher average scores (p < .05) for both all terms and the Abrams terms than participants without experience. Average scores for participants with agricultural experience on researcher-driven terms were also higher than those without experience, though the difference was not significant.

This lack of significance could be due to a lack of statistical power, as we had a 24% chance of missing a small effect at an alpha level of .10. We did have a small number (n = 147) of participants with experience with agriculture. A lack of significant difference could also be a function of a problem with our researcher-driven terms scale. While reliability of the scales was above the acceptable levels, the reliability for the researcher-driven terms subscale bordered on too high (Cortina, 1993; Hulin, Cudeck, Netemeyer, Dillon, McDonald, & Bearden, 2001), suggesting a great deal of overlap or a scale that is too long overall to measure this construct. For example, we asked participants about both crossbred organism and crossbred food as well as hybrid organism and crossbred organism. Some items may need to be dropped in future research or investigated further with item-response theory.

However, the lack of significant difference between groups based on agriculture experience could also be reflective of an overall lack of difference in understanding on GE technology related terms in both groups, given low overall term familiarity in participants in our study. Previous evaluations such as Hallman et al. (2013) and peer-reviewed research from Abrams et al. (2015) support this conclusion that U.S. adults are not very knowledgeable about GE technology. Surveys from Kahan (2015) indicating a lack of U.S. adult polarization on genetic engineering, coupled with related research on nanotechnology that suggest polarization on emerging technology topics might result only after participants are knowledgeable on the subjects, also support our findings of low knowledge levels in this study.

Our results indicate several areas for future research and practice. For educators, the low familiarity of genetic related terms we found, especially in the population lacking experience in agriculture, supports the mere-exposure effect for genetic engineering technology (Zajonc, 2001). Term familiarity and therefore awareness knowledge in Rogers’ hierarchy is lacking among U.S.
adults on the subject of genetic engineering in the context of food. More formal, informal, and nonformal education programming on terms relating to genetic engineering will increase familiarity. Programs should also take into account dimensions of human health versus environmental risk, and they should not treat GE technology as a single issue but a series of related cases based on individual crops and their individual risks and benefit scenarios. However, given differences in familiarity based on agriculture experience, programs should look different for different audiences based on this dimension of participant background. As experience in agriculture is also low among our respondents, creating and bolstering avenues for education and exposure to more general genetic literacy as well as agriculture overall may also be helpful. Knowledge alone may not be the primary indicator of future decision-making. Therefore more overall experience in agriculture and relationships with people who support agriculture (Kahan, 2008) may increase support for agribiotechnologies.

For researchers, as participants in our study reported higher educational levels than reported by the U.S. Census and were a non-probability sample, the low scores on term familiarity assessment may actually overestimate knowledge on GE technology among the entire U.S. adult population. However, it is unclear how many participants would have learned terminology related to genetic engineering in formal school, given the recent emergence of the technology and concerns about a lack of quantity or quality agricultural or biological science education in schools. The same could be said of other demographic categories such as income. Future studies should examine the relationship of familiarity with educational background and performance in agricultural or biological sciences. Future research should also examine compare self-reports of education and other demographics with other valid and reliable scales about general science and agricultural literacy and create valid and reliable scales to directly measure knowledge of biotechnology terms and concepts. Such support will address the AAAE Research Agenda Priority 1 on agricultural literacy (Enns et al., 2016). Further, researchers might expect experience in agriculture to be more common amongst older age groups based on demographic trends about the percentages of people living and working on farms declining at the end of the 20th century (Environmental Protection Agency, 2013). However, we found a smaller percentage of older Americans reported any experience with agriculture, which may reflect willingness to engage with an online survey or panel. The discrepancy between census figures and our results highlights a need to have better measures of agricultural experience for many studies of these populations and topics. Future research should formalize this scale and test the items for reliability and validity. We did not examine experience with genetics more broadly, such as in medical contexts. Determining the role of experience in genetics and medical genetic engineering may also help understand support for GE technology in food. These issues may all vary in current student populations as well, and therefore these same research questions should be asked of them.

Higher familiarity can increase our confidence in studies using terms without definitions, such as those examined here. This will allow us to obtain better pictures of public perceptions and beliefs on genetic engineering for food and other crops. Future research on public support for genetic engineering should take into account that the survey population may not have the foundational knowledge necessary for discussing these complex ideas, especially without establishing definitions in the course of the research. Providing researcher-generated definitions or asking participants to generate their own definitions for comparison to other answers may be necessary to ensure meaningful, quality data. At the least, research should include assessments of term familiarity when considering such jargon-heavy technology discussions. We know Americans are not a uniform public, and the better we understand their experiences with agriculture as a potential mediating factor on acceptance of and support for genetic engineering, and more broadly, agribiotechnology, the more effectively we can target messages or interventions for particular subgroups.
References


A Quasi-Experimental Examination: Cognitive Sequencing of Instruction Using Experiential Learning Theory for STEM Concepts in Agricultural Education

Kasee L. Smith & John Rayfield

Abstract

Understanding methods for effectively instructing STEM education concepts is essential in the current climate of education (Freeman, Marginson, & Tyler 2014). Kolb’s experiential learning theory (ELT) outlines four specific modes of learning, based on preferences for grasping and transforming information. This quasi-experimental study was conducted to test the effect of cognitive sequencing of instruction in the dimension of grasping information through ELT. Two units of STEM-enhanced instruction were develop, each with two separate sequences; one with concepts presented beginning with a concrete experience and moving to an abstract conceptualization and the other in the opposite sequence. Introductory agricultural science courses in four Texas high schools were randomly assigned to one of four experimental groups (n = 121). This experiment utilized a crossover design to allow each student to experience both cognitive sequences (Shadish, Cook, & Campbell, 2002). This portion of a larger study examined the independent variables of cognitive sequence of instruction and student preference for grasping information in relation to the dependent variables of student change score from pretest to posttest for both units of instruction. Findings indicated significant interactions on both units of instruction between student preference for grasping information and cognitive sequence of instruction.

Keywords: cognitive sequencing, experiential learning theory, STEM, learning preferences

Introduction

In the last ten years, secondary education has been called upon for more than preparing students for a recall of basic information (Carnoy & Rothstein, 2013). This shift in focus is not without warrant. According to the World Economic Forum, the United States ranked fifty-first in quality of math and science education when compared to all nations worldwide (Schwab, 2011). Secondary students in the U.S. have demonstrated declining comparative performance in STEM areas over the last two decades (Carnoy & Rothstein, 2013), and there are growing concerns that students are not completing their education with the skills and knowledge required to enter higher education and skilled careers (Maltese, Potvin, Lung, & Hochbein, 2014).

The abstract nature of many STEM concepts has led researchers to conclude that these topics are best taught using subjects that allow a connection to their real-world application (Boaler, 1998; Kieran, 1992; Stone, 2011; Woodward & Montague, 2002). Career and Technical Education (CTE) courses, including agricultural education, have been seen as a possible context for teaching STEM concepts, as these courses often include a contextual frame for abstract STEM topics (Stone, 2011).

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Agricultural education is rooted in experiential learning (Baker, 2012; Roberts, 2006). The process of integrating abstract concepts in an agricultural setting can be facilitated through the use of Kolb’s (1984) experiential learning theory (ELT) as the model through which to deliver, reinforce, and evaluate student learning (Baker, 2012; Roberts, 2006). Quality educators use multiple instructional methods during a given unit, and even within the same class period to help facilitate learning (Marzano, Pickering, & Pollock, 2001).

Although research on single instructional methods may not be a realistic approach to examining effectiveness, studies of the overarching principles of instruction common to all instructional methods could yield viable results (Eggen, Kauchak, & Harder, 1979; Tallmadge & Shearer, 1971). One of the overarching principles of instructional methods is the concept of sequencing instruction (Reigeluth, 2013). In traditional instruction, education begins with providing information related to an abstract concept. This information is then applied to a concrete experience as a demonstration of understanding and a method of retention (Reigeluth, 2013). Switching instructional delivery to begin with a concrete experience prior to the abstract concept could allow an investigation related to the order of educational events. One approach to understanding how agricultural education could assist students in grasping STEM concepts would be to use the ELT model as a framework for exploring the sequencing of STEM instruction in agricultural education courses.

Conceptual Framework

The conceptual framework for this study was developed from Kolb’s (1984) experiential learning theory using Gagne’s (1965) theory of instruction as a frame for controlling variables in delivering experimental treatments. Gagne’s model is widely accepted as a complete overview of the instructional process, provides methods for independent evaluation of variables (Driscoll, 2004; Reigeluth, 1983). This study was heavily influenced by Kolb’s experiential learning theory as the method for presenting the stimulus to students. The model shows the cyclical process of learning as a relationship between the four modes of active experimentation (AE), concrete experience (CE), reflective observation (RO) and abstract conceptualization (AC) (Kolb, 1984, 2015). The resulting conceptual model for this study is shown in Figure 1.
Figure 1. Conceptual model of student learning. Based on Kolb’s (1984, 2015) experiential learning theory and Gagne’s (1965) nine events of instruction.

This study was designed to employ the conceptual model in an examination of student performance by using experimental curricula developed to standardize the events of instruction as outlined by Gagne (1965), manipulating only the cognitive sequence with which information was presented. Resulting changes in learning between dependent measures were examined in relation to student learning preference and cognitive sequence of instruction.

Review of Literature

Almost every country has examined the importance of integrating STEM concepts into their educational programming (Freeman, Marginson, & Tyler, 2014). In the US, nearly 91% of American adults feel as though science and technology education gives students opportunities for growth and success, and over 60% believe current math and science education is inadequate (Maltese, et. al., 2014). In late 2013, a joint report from the National Science Foundation and the Department of Education highlighted suggestions for STEM education. Among these suggestions was to “provide more opportunities for hand-on, real-world STEM activities at the secondary level” (Ferrini-Mundy, 2013).

Career and Technical Education (CTE) courses have been suggested as a platform for teaching STEM concepts (Stone, 2007, 2011). Stone (2011) analyzed shifts in the pressure applied to CTE courses to integrate STEM concepts beginning in the 1970s. He concluded that models integrating STEM concepts into CTE courses were viable, and noted “STEM-focused education can be incorporated into any CTE delivery system, program, or curricular or pedagogical approach within CTE” (Stone, 2011, p. 13). Both the Math-in-CTE initiative (Stone, Alfeld, & Pearson, 2008) and the Science-in-CTE initiative (Pearson, 2015; Pearson, Young, & Richardson, 2013) have been conducted to examine the successful learning of STEM concepts in CTE courses. These programs have yielded positive results and longitudinal studies are underway.
Contextual learning is not new to CTE or agricultural education. Furner and Kumar (2007) and Shinn et. al. (2003) have examined the important role of agricultural education in bridging the gap between the known and unknown through contextualized learning. The contextual bridge between agricultural education and STEM concepts is well established; agriculture teachers rate the importance of integrating STEM concepts high and have an awareness of shifts in educational structure mandating integration STEM concepts (Myers & Dyer, 2004; Smith, Rayfield, & McKim, 2015). Stubbs and Myers (2015) reported integration of STEM concepts as an essential component of a quality agricultural education program.

Experiential learning theory is based on the premise that learning is a dynamic interaction between the learner, methods through which information is gathered, and methods by which information is processed in the mind (Kolb, 1984, 2015). The resulting model is the cyclical process of the experiential learning cycle. This cycle includes two sets of dialectically opposed modes of learning: Active Experimentation (AE) and Reflective Observation (RO) related to transforming experience, and Concrete Experience (CE) and Abstract Conceptualism (AC) related to grasping experience. Through ELT, Kolb outlines two distinct modes of grasping experience; apprehension, based on concrete experiences, and comprehension, based on abstract conceptualization (Kolb, 2015), and highlights that individuals will have a preference between the opposing modes of learning (Kolb, 2015).

There are those who argue learning preference cannot be used as a standalone assessment of learning ability (Pashler, McDaniel, Rohrer, & Bjork, 2008). Others have noted the importance of understanding individual student learning factors in education (Brokaw & Merz, 2000; Claxton & Murrell. 1987; Coffield, Moseley, Hall, & Ecclestone, 2004a, 2004b; Duff, 2004; Dunn and Dunn, 1989; Felder & Silverman, 1988; Fleming, 2001; Gregorc, 1979; Kolb, 1985, 2015; Tomlinson, 1999). Sousa (2011) noted, “there is little argument that people have various internal and external preferences when they are learning” (p. 59). Due to the close tie between Kolb’s Learning Style Inventory (KLSI) and ELT, we used this instrument as an assessment of student learning preference for grasping information.

Several researchers have examined sequence of instruction in general (Bloom, Englehart, Furst, Hill, & Krathwohl, 1956; Reigeluth, Merrill, Wilson, & Spiller, 1980; Scandura, 1983; Webb, 1997). These concepts of sequencing instruction have often included only the sequencing of concepts and topics, rather than sequencing the modes of learning or type of instruction. The concept of sequencing an initial exposure to instructional information from a specific end of the ELT continuum has not been fully examined. Baker, Brown, Blackburn, and Robinson (2014) conducted an initial examination into presentation order of concepts within the context of experiential learning theory for post-secondary students using agriculture as the context. While their findings failed to reveal significant differences between order of abstraction and type of reflection, they recommended further research in this area, specifically within the secondary classroom.

Research into effective methods for integrating STEM concepts into agricultural education within the framework of ELT may yield important results related to instruction for individual students. Cognitive sequencing may play an important role in allowing students to grasp abstract concepts as applied in a contextual setting (Garlick, 2010; Marzano, et. al., 2001; Reigeluth, 1983). This research was conducted to fill the gap in the knowledge base by analyzing cognitive sequencing in STEM education concepts through the pedagogical approach of ELT, allowing for the most effective sequences for students based on learning preferences to be revealed, and giving agricultural education students access to the most efficacious methods for learning STEM content.
Purpose and Objectives

The purpose of this portion of a larger study was to determine the effect of cognitive sequence of instruction and student learning preference for grasping information on student learning of STEM concepts in agricultural education. To guide the research, the following objectives were developed:

1. Describe the effect an interaction between student learning preference for grasping information and cognitive sequence of instruction has on student change scores on STEM content assessments.
2. Describe the variance of student change scores attributed to student preference for grasping information.
3. Describe the variance of student change scores attributed to cognitive sequence of instruction.

This quasi-experiment was developed to test the following null hypothesis:

Ho: There is no interaction between student preference for grasping information and cognitive sequence of instruction for student change scores on STEM-based content assessments in agricultural education

Methods and Procedures

This study was conducted using a quasi-experimental design, utilizing students enrolled in Principles of Agriculture, Food, and Natural Resources (AFNR) courses in Texas as the functional experimental units. Quasi-experimental research was popularized by Campbell and Stanley (1963) and can be defined as “an experiment in which units are not randomly assigned to conditions” (Shadish et. al., 2002, p. 511). The experiment used a repeated measures crossover design including a control group (Campbell & Stanley, 1963; Shadish, et. al., 2002) to allow for multiple data collection points from each student.

Sites were recruited through purposive selection based on the diversity of school population, regional differences, location in relation to [University], and teacher qualities including commitment to project and teaching history. Fraenkel, Wallen, and Hyun (2006) noted that purposive sampling is sometimes necessary in quasi-experimental educational research due to the need for collaboration between researchers and school personnel. Of twelve identified sites, four were successful in completing authorization and data collection for both experimental rounds. The final population included students enrolled in the Principles of Agriculture, Food, and Natural Resources courses at four high schools in Texas, \( n = 121 \). Experimental treatments were randomly assigned to each site, as shown in Table 1. According to Shadish, et. al. (2002) quasi-experimental research may require groups of experimental units to be randomly assigned to a treatment collectively, if they are pre-organized into logistically viable groups.
Table 1

**Experimental Treatment Profiles by Site**

<table>
<thead>
<tr>
<th>Site</th>
<th>Round One Curriculum Sequence</th>
<th>Round Two Curriculum Sequence</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>O₁ -- -- O₂ O₃ -- -- O₄</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>O₁ Water AC-CE O₂ O₃ Soil CE-AC O₄</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>O₁ Soil AC-CE O₂ O₃ Water CE-AC O₄</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>O₁ Soil CE-AC O₂ O₃ Water AC-CE O₄</td>
<td></td>
</tr>
</tbody>
</table>

Two units of experimental curricula were developed for this study. Each unit was developed in two formats; one cognitively sequenced with each new concept beginning with a concrete experience and moving toward abstract conceptualization, and another with each new concept beginning with abstract conceptualization and moving toward a concrete experience. It is important to note that the unit topics were selected because of the presence of many abstract science concepts, which could allow cognitive sequencing to be examined in STEM contexts. To ensure curricula met the rigorous requirements for use as experimental treatments and to establish content and face validity, they were designed with guidance from a cognitive psychologist and agricultural curriculum developers. Gagne’s nine events of instruction (1965) were held constant during each round of testing except “presenting the stimulus” which varied based on which mode of grasping experience was presented first. Gagne (1965) theorized that by following the nine events of instruction, external learner variables can be controlled in test groups. Each test site received both content areas, sites were randomized as to which content area and cognitive sequence they would receive first. The crossover design allowed each student to experience both units of instruction and both cognitive sequences.

Experimental treatments for this study were designed to be instructed exactly as developed, using provided lesson plans, worksheets, laboratories, and information. Completing this research within the parameters of the study design relied on teachers at each experimental site instructing the curricula exactly as designed. The possibility of deviation from the intended curricula posed a limitation to this study. To overcome this limitation and ensure fidelity of treatment, extensive training and instruction on the use of the curriculum materials was provided to teachers and agreements of compliance were signed and collected from teachers administering the experimental treatments.

Three instruments were used in this study; content knowledge assessments for both the water and soil science units, and *KLSI v 3.1*, which was used to determine student preference for grasping experience in study participants. Unit assessments were developed to directly assess each of the unit objectives with exam questions at multiple levels of cognition. Linkages between individual instrument items and objectives, along with cognitive levels of exam items were established during instrument development. According to Frisbie (1988), the most appropriate method for determining the reliability of a typical teacher-made test using multiple question formats is through the employment of a *KR-20* coefficient. Resulting coefficients (*KR-20*) were 0.75 for the water science pretest and 0.78 for the water science posttest. For the soil science tests, the resulting reliability coefficients (*KR20*) were 0.81 for the pretest and 0.86 for the posttest. Reliability coefficients for teacher-made tests are considered to be acceptable at a minimum level of 0.65.
(Frisbie, 1988), therefore the reliability of both unit assessments were deemed acceptable for the intended purpose of this study.

The paper version of the KLSI v. 3.1 instrument was used to determine the learning style preference for respondents in regard to grasping information. The format of KLSI v. 3.1 is a forced-choice response to 12 instrument items. Each item contains a statement prompt and asks respondents to rank their preferences for four answer choices, which correspond to the four learning modes of Kolb’s (1984) experiential learning theory (ELT). Respondent rankings are ordinal from 4 “most like me” to 1 “least like me” (Kolb & Kolb, 2013). Validity of the KLSI v. 3.1 has been widely established for use in the field of education (Kolb & Kolb, 2005), and was determined to be acceptable for the purposes of this study. Previous measures of reliability for the four learning KLSI learning modes range from \( \alpha = 0.77 \) to \( \alpha = 0.84 \) (Kolb & Kolb, 2005), and reliability was determined to be suitable for use in this study. To maintain group sizes large enough for statistical examination, student preference for concrete experience or abstract conceptualization was classified dichotomously, using the cut scores provided with the KLSI v 3.1 manual (Kolb & Kolb, 2005). This decision is similar to the decision to use a bipolar classification of preference for grasping and transforming information by Baker (2012).

This quasi-experiment was conducted in the fall semester of 2015. Data were collected in two phases: collection of student characteristics, and collection of STEM assessment knowledge. The first phase of data collection was the collection of information related to participant demographic and classification variables. Per Institutional Review Board requirements, parental consent and student assent were obtained by each student in the Principles of AFNR courses for each participating school. Consent and assent were obtained for \( n = 121 \) of the students for an overall inclusion rate of 94.5\% of all students (\( N = 128 \)). We travelled to sites to collect information regarding student demographic characteristics and to administer the KLSI v. 3.1 instrument to students.

The final phase of data collection was completed by the agriculture teachers who participated in the study. Prior to teaching each unit, teachers administered a pretest, and at the completion of each unit of experimental curricula, a posttest was administered. These assessments included no names, only a unique identifier for each student. Tests were hand-scored once by the teacher according to the predefined answer key, and again by the research team to ensure scoring was consistent and correct. Scores on the pre and posttests were added to the encrypted spreadsheet, and a change from pretest to posttest score was calculated.

Initial data were analyzed with an omnibus multivariate analysis using IBM SPSS v. 23. A multivariate analysis of variance was determined to be the optimal statistical tool for interpreting information from this study (Meyers, Gamst, & Guarino, 2012; Stevens, 2009). Tabachnick and Fidell (2007) mentioned the need to carefully examine the use of MANOVA in crossover designs, as the variation in treatment across measures may be due to the effects of crossing treatments, rather than true interaction when assumptions are violated. After running a MANOVA analysis, two of the assumptions of MANOVA were violated, and the decision was made to examine the two units of instruction separately using two univariate ANOVAs (Howell, 2012; Mayers, 2013; Tabachnick & Fidell, 2007). The resulting univariate analyses yielded two ANOVAs from the same data set. The alpha level for significance was adjusted using Bonferroni’s adjustment (Meyers, et. al., 2013; Stevens, 2009; Tabachnick & Fidell, 2007), resulting in an adjusted alpha level of \( p < 0.02 \) for determining significance.
Findings

Prior to analyzing the results related to the research objective, data were analyzed using ANOVA to determine if statistically significant differences existed in the four test sites on the pretest measures. An initial examination of prior knowledge was necessary to interpret subsequent differences which may have existed based on teacher or school factors rather than the independent variables. No significant differences ($F(3,117) = 1.22, p = 0.30, \eta_p^2 = 0.03$) were found in the pretest water science assessment scores between students at the sites. The ANOVA examination of the raw scores on the soil science unit exams revealed statistically significant differences ($F(3,117) = 5.10, p = 0.02, \eta_p^2 = 0.15$) in the means between sites on the soil science pretest assessment. Post hoc analysis showed differences only between sites three and four. The nature of this study allowed for an examination of change from pretest to posttest (Shadish, et. al., 2002), and as such, the differences in pretest scores were noted for examination in the outcomes of hypothesis testing, but deemed no threat to the analysis of findings related to the objectives.

To begin the analysis related to the research objectives, the descriptive results of change from pretest to posttest on both the water science and soils science unit assessments were calculated and are shown in Table 2.

Table 2

<table>
<thead>
<tr>
<th>Variable</th>
<th>Category</th>
<th>Water Science Unit</th>
<th>Soil Science Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>$n$</td>
<td>$M (SD)$</td>
</tr>
<tr>
<td>Grasping Preference</td>
<td>Apprehension</td>
<td>85</td>
<td>41.82 (24.57)</td>
</tr>
<tr>
<td></td>
<td>Comprehension</td>
<td>36</td>
<td>30.53 (28.93)</td>
</tr>
<tr>
<td>Sequence of Respective Unit</td>
<td>AC to CE</td>
<td>72</td>
<td>43.69 (17.97)</td>
</tr>
<tr>
<td></td>
<td>CE to AC</td>
<td>31</td>
<td>48.45 (31.04)</td>
</tr>
<tr>
<td></td>
<td>Control</td>
<td>18</td>
<td>0.33 (3.24)</td>
</tr>
</tbody>
</table>

Note: The crossover design allowed for students receiving the water science unit in the AC to CE sequence to receive the opposite treatment for the soil science unit, which accounts for the differences in $n$ between sequences.

Following an analysis of the descriptive means, the means for each of the units of instruction were compared by using univariate analyses. The results of the omnibus ANOVA examination for the water science unit revealed significant differences ($p \leq 0.02$) in the dependent variable. Significant differences were found for both preference for grasping experience ($F(1,115) = 11.07, p = 0.01, \eta_p^2 = 0.09$) and cognitive sequence of instruction ($F(2,115) = 60.65, p = 0.01, \eta_p^2 = 0.51$). These findings were superseded by the finding of a single statistically significant ($F(2,115) = 38.19, p = 0.01, \eta_p^2 = 0.40$) interaction involving both preference for grasping experience and cognitive sequence. Based on the guidelines set forth by Cohen (1977), this difference had a large effect size $\eta_p^2 \geq 0.14$, and showed a high level of power. Based on the findings, the null hypothesis was rejected, and it was determined that interactions between cognitive sequence and preference for grasping experience did exist. Results of the omnibus ANOVA are shown in Table 3.
Table 3

ANOVA Table for the Effect of Preference for Grasping Knowledge and Cognitive Sequence on Change in Pre and Posttest Scores on Water Science Unit Assessments

<table>
<thead>
<tr>
<th></th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>p</th>
<th>$\eta^2$</th>
<th>1-(\beta)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grasping</td>
<td>2922.20</td>
<td>1</td>
<td>2922.20</td>
<td>11.07</td>
<td>0.01*</td>
<td>0.09</td>
<td>0.91</td>
</tr>
<tr>
<td>Sequence</td>
<td>32014.49</td>
<td>2</td>
<td>16007.24</td>
<td>60.65</td>
<td>0.01*</td>
<td>0.51</td>
<td>1.00</td>
</tr>
<tr>
<td>Grasping*Sequence</td>
<td>20160.22</td>
<td>2</td>
<td>10080.11</td>
<td>38.19</td>
<td>0.01*</td>
<td>0.40</td>
<td>1.00</td>
</tr>
<tr>
<td>Error</td>
<td>30352.84</td>
<td>115</td>
<td>263.94</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>262248.00</td>
<td>121</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: Significant alpha level was determined *a priori* at an adjusted level of $p \leq 0.02$ to account for analysis of both units of instruction

The analysis of the soil science unit yielded similar results, which are shown in Table 4. A significant difference ($F(2,115) = 69.17, p = 0.01, \eta^2 = 0.55$) was found related to student preference for grasping information which was superseded by a significant interaction ($F(1,115) = 17.58, p = 0.01, \eta^2 = 0.23$) between sequence of instruction and preference for grasping information.

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Table 3

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<table>
<thead>
<tr>
<th></th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>p</th>
<th>$\eta^2$</th>
<th>1-(\beta)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grasping</td>
<td>93.95</td>
<td>1</td>
<td>93.95</td>
<td>0.41</td>
<td>0.53</td>
<td>0.01</td>
<td>0.10</td>
</tr>
<tr>
<td>Sequence</td>
<td>32028.74</td>
<td>2</td>
<td>16014.37</td>
<td>69.17</td>
<td>0.01*</td>
<td>0.55</td>
<td>1.00</td>
</tr>
<tr>
<td>Grasping*Sequence</td>
<td>8138.91</td>
<td>2</td>
<td>4069.46</td>
<td>17.58</td>
<td>0.01*</td>
<td>0.23</td>
<td>1.00</td>
</tr>
<tr>
<td>Error</td>
<td>26624.92</td>
<td>115</td>
<td>231.52</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>310351.00</td>
<td>121</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: Significant alpha level was determined *a priori* at an adjusted level of $p \leq 0.02$ to account for analysis of both units of instruction

Following the results from the ANOVA analyses, simple main effects tests were conducted to further investigate the interaction. The results of the simple main effects tests revealed that, for both units of instruction, students had significantly higher scores in the unit sequenced to begin with their preferred method of grasping information. The resulting profile plots for both units are shown in Figures 2 and 3.
Conclusions/Implications

This study was an exploratory examination of cognitive sequencing of STEM concepts in agricultural education, in an effort to gain insight into how the cognitive principle of sequencing instruction might play a role in student understanding of STEM concepts. The study was developed
using the foundational underpinnings of experiential learning, which is already at the foundation of agricultural education (Baker, 2012; Roberts, 2006). Through this examination, we can begin to frame methods for instruction which might help agricultural educators better guide students through the abstract STEM concepts they are being asked to teach (Myers & Dyer, 2004). The findings of this study lend support to the fact that it is not only what agricultural educators are teaching in regards to STEM concepts in agricultural education, it is how they are teaching it that may make the critical difference for students.

The results of this study highlight the importance of cognitive sequencing as a factor related to change in score from pretest to posttest. By using a crossover design, each student could be evaluated in relation to their preference for grasping experience and their performance on purposively sequenced units. For the \( n = 121 \) students involved in this study, differences were evident. The results reveal that sequencing of instruction resulted in greater changes in assessment scores as an interaction with preference for grasping experience. Student differences based on cognitive sequence have direct implications for agricultural educators as they work to instruct STEM concepts.

Three main findings emerge from this study: students in this study who preferred to grasp experience through apprehension had higher change scores from pretest to posttest when the units were sequenced to begin with a concrete experience, students who preferred to grasp experience through comprehension had higher change scores when the units were sequenced to begin with abstract conceptualization, and students performed with higher change scores in the unit cognitively sequenced to match their preferred learning style, regardless of unit content.

Many of the concepts in STEM education are abstract in nature (Maltese, et. al., 2014), and the hands-on nature of agricultural education and other CTE courses have been seen as a platform for delivering these concepts (Stone, 2010). For students who prefer to grasp information through apprehension, the presentation of abstract concepts through abstract conceptualization, which is common in traditional education (Reigeluth, 2013), may not provide the stimulus they need to effectively grasp the new information.

The majority of students in this study (\( n = 86 \)) had a preference for grasping experience through apprehension. If the proportion of students who prefer apprehension over comprehension is similar in the total population of agricultural education students to the proportion in this study, there could be a large number of students who would benefit from a sequencing instruction to begin with concrete experiences. Providing students preferring apprehension over comprehension a concrete experience at the beginning of the instruction allows them to have an experience to tie the abstract concepts to (Garlick, 2010; Kolb, 2015). According to Kolb (2015) those who prefer concrete experience (apprehension) have “a concern with the uniqueness and complexity of present reality as opposed to theories and generalizations” (p. 105).

Students with a preference for grasping experience through comprehension were found to have higher changes in scores when new concepts were presented with an abstract conceptualization focus first. What implications does this have for agricultural education? The traditional model of curriculum design, which includes instruction in abstract concepts followed by concrete application of those abstractions is well-suited for students who prefer to grasp experience through comprehension (Reigeluth, 2013). These students are more suited to learning abstract concepts through traditional educational methods.

Students with both types of preferences exist in an agricultural education classroom, so which of the cognitive sequences is better suited for development of curriculum materials?
Sequencing instruction based on individual student preferences for grasping information has close
ties to the literature related to differentiated instruction. Tomlinson (1999) stated the importance
of tailoring educational practices to meet the needs of each student. The findings of this study give
an example of just how critical differentiated instruction is when dealing with STEM concepts in
agricultural education classes. Students in this study showed drastically higher scores when they
were given the opportunity to grasp information in a sequence tailored to their preference. This
small change to educational methods may have broad-reaching effects, not only for STEM concepts
in agricultural education, but for education as a whole.

It is important to note that, within the confines of ELT, the entire learning cycle must be
completed in order for learning to occur. Students who have a preference for apprehension are not
likely to learn only through the concrete experience, it must be supplemented by reflective
observation, abstract conceptualization, and active experimentation in order for the intent of ELT
to be met (Baker, 2012; Kolb, 2015).

Recommendations

These conclusions serve as a starting point for a discussion on how our practices can best
meet the needs of our students. Agricultural education is charged with providing context to abstract
STEM concepts (Myers & Dyer, 2004). To this point, there has been little research on the best
ways to deliver this content effectively (Stone, 2010). Perhaps by returning to our ELT roots
(Roberts, 2006; Baker, et. al. 2012) and differentiating our instruction based on individual learning
preferences (Tomlinson, 1999) through cognitive sequencing, we can stimulate the change our field
needs to meet the challenge.

Because both preferences for grasping information exist in a secondary agricultural
education classroom, it is recommended to alternate and combine instruction in STEM concepts
from both apprehension and comprehension of the apprehension dialectic. Careful attention should
be paid during the design of instruction to ensure that students are receiving exposure to the
complete learning cycle as defined through ELT. In-service teachers should be properly instructed
in methods that allow them to teach using the full ELT cycle. Professional development should be
created and presented to in-service teachers to highlight the effects of cognitive sequencing based
on learning style.

The results of this study yield promising areas for investigation in a secondary agricultural
education classroom. Cognitive sequencing may be the most feasible method educators can use to
tailor learning to the preferences of each student. With professional development instruction,
teachers could learn methods for varying the sequencing of concepts in their classrooms. Varied
instruction could be as simple as splitting the class based on learning preferences and setting up
learning stations that would allow instruction take place beginning with a concrete experience for
students who prefer to grasp through apprehension and beginning with the explanation of abstract
concepts for those who prefer to grasp through comprehension. With minimal effort on the part of
the teacher, all students could be instructed in the sequence that matches their preferences. In-
service should include instruction on how to present new concepts using both an apprehension and
comprehension beginning point.

One of the largest reflective comments from the teachers who delivered the experimental
units was that delivering instruction beginning with a concrete experience felt unnatural. It stands
to reason; these teachers were likely students who learned in a traditional education model with
concepts sequenced from AC to CE (Reigeluth, 2013). They most likely learned to teach from
instructors who modelled and shared an AC to CE method for learning (Reigeluth, 2013). We
recommend continued emphasis on both sequencing instruction and the design of lessons using ELT for preservice agricultural educators to help them understand that variation can exist. Preservice teachers should be made aware of the potential effects of cognitive sequencing on student learning. We recommend teacher educators consider adding lesson plan formats that include identification of each component of ELT. They should also be given the opportunity to develop lessons which are not sequenced in a traditional AC to CE format.

Additional research is needed to completely understand the role sequencing of instruction might play in both STEM education and agricultural education as a whole. Although this examination looked specifically at abstract STEM concepts, an examination of the role of the transformation dimension, replicating this study with engineering and mathematics concepts, and examining units of instruction with alternating or combined sequences of instruction are all recommended areas for continued exploration. We also recommend a replication of this study in fields outside of agricultural education, to test the interdisciplinary reach of instruction purposively sequenced based on ELT.

Experiential learning theory is a valuable tool which many believe may be at the very core of agricultural education. Attention to this theory as a systematic method for instruction, rather than a suggested principle could yield the understanding of how to integrate content and STEM concepts more effectively for all students. This study is the initial examination of a much larger concept. Combining purposively sequenced instruction with the foundations of ELT could bridge the gap between abstract concepts and knowledge for agricultural education students, and may allow agricultural educators to effectively integrate STEM concepts for all students.

References


A Profile of Agricultural Education Teachers with Exemplary Rural Agricultural Entrepreneurship Education Programs

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Abstract

Rural entrepreneurship education programs may be a great tool for enhancing rural livelihoods and reducing rural outmigration. Entrepreneurship has received attention in school based agricultural education, primarily through implementation of Supervised Agricultural Experience (SAE) programs. Very little research has looked at the teaching of entrepreneurship. As a part of a larger research project, this study looked at characteristics of teachers who implement exemplary rural agricultural entrepreneurship education programs. Results revealed that teachers: (a) were experienced, (b) held advanced degrees, (c) had prior experience with entrepreneurship, (d) generally were considered outstanding teachers, and (e) were described as being open minded and enthusiastic. Recommendations are made based on these conclusions.

Keywords: entrepreneurship; agricultural education; rural; teachers

Introduction

Youth, the world over, have been leaving rural areas and have shown a general lack of interest in agriculture as a livelihood (Bennell, 2010; FAO, 2010; USDA, 2015). Programs that teach agricultural entrepreneurship education to youth have existed (Acker & Gasperini, 2009; Phipps, Osborne, Dyer, & Ball, 2008). Entrepreneurship in agriculture may hold the key to engaging rural youth in agriculture and helping to stem the outflow of rural youth to urban areas. However, little is known about effective programming with this topic for this unique audience.

Agricultural entrepreneurship opportunities have existed in rural areas around the world. Whether it has been selling lavender plants in rural Washington state (Markley, Macke, & Luther, 2005) or raising poultry in Paraguay (Acker & Gasperini, 2009), entrepreneurship opportunities have abounded in rural areas all across the globe. Today, entrepreneurship has been promoted in agriculture by the Farm Bureau (2015), United States Department of Agriculture, USDA, (n.d.), and the United Nations (n.d.). Despite these seemingly endless business ventures, few youth have entered agriculture as entrepreneurs. Engaging youth has been critical, especially in important industries such as agriculture, as they represent a growing segment of society worldwide and are, quite literally, the future decision makers.

The United States has had a long history of engaging youth in agriculture and entrepreneurship ventures through school-based agricultural education and youth programs such as FFA and 4-H (Phipps et al., 2008). In a unique tripartite teaching platform, agricultural education has been taught through the classroom and laboratory setting, supervised agricultural experience programs (SAE) and leadership development and competition through involvement with the FFA.
A balanced agricultural education program has all three components and is represented by the central portion of the overlapping circles.

Through their SAE, students in most states have been required to have a personalized program, which can mean starting and running their own business, called an entrepreneurship/ownership SAE (Phipps et al., 2008). Students would take the necessary steps to invest their time and money to starting the enterprise, keep records on the operation, and be able to apply for awards for increased levels of efficiency through the FFA awards structure. Students would also learn skills and knowledge relevant to their operation through classroom and laboratory instruction, which helped further improve their entrepreneurship endeavors. For nearly twenty years an award was given through the National FFA Organization called the Agri-Entrepreneurship Award for the most outstanding entrepreneurship enterprise in agriculture from around the nation for students enrolled in agricultural education, but this award was cancelled in 2010 (K. Keith, July, 2015, personal communication).

Entrepreneurship education programs in agriculture can develop entrepreneurial thinking and skills (Valerio, Parton, & Robb, 2014), yet the characteristics of exemplary entrepreneurship programs have been unknown. Co-curricular and extracurricular programs have offered likely structures for capacity building of youth in competencies of entrepreneurship (Daniel & Kent, 2005; Morris, Kuratko, & Cornwall, 2013). While it has been documented that entrepreneurship programs can foster improved entrepreneurial thinking and skills, characteristics of exemplary rural agriculture entrepreneurship programs have been generally undocumented. This study fills part of the knowledge gap on the phenomenon of rural youth agricultural entrepreneurship education programs. It is acknowledged that entrepreneurship is an accepted form of SAE and has received some attention in the empirical literature (see Rank & Retallick, 2016 for a good synthesis of the research; Roberts & Harlin, 2007 for a good summary of the theory). This study, however, focuses on the teaching of entrepreneurship, which has not received much attention in the agricultural education empirical literature. This study will begin to address this deficit and aligns with Research Priority Areas 3 and 6 of the AAAE National Research Agenda (Roberts, Harder, & Brashears, 2016).

Conceptual Framework

The conceptual framework for this study (see Figure 1) is an adaptation of the one developed by Valerio et al. (2014) “in order to analyze a global sample of entrepreneurship education and training programs based on available evaluations” (p. 5). Their model consisted of programmatic characteristics, participants, and context as three separate constructs all encircling outcomes, which is a fourth construct. Each construct consisted of several sub-constructs.
The program context construct included sub-constructs of economic, political, and cultural context. The participant characteristics construct was intended to capture the “moderating influence of what participants bring with them coming into a program” (Valerio et al., 2014, p. 4). This included sub-constructs of the individual’s profile, basic demographic identifiers and personality factors or traits, education, interest and intentions and behaviors while enrolled. Outcomes were divided into four domains: entrepreneurial mindsets, entrepreneurial capabilities, entrepreneurial status, and entrepreneurial performance. This model was used to guide a series of studies. The specific focus of the current study was on teacher characteristics.

A review of the literature focused on rural agricultural entrepreneurship education programs in the United States revealed a significant gap, especially when looking at characteristics of teachers who implement these programs. Several studies about teacher characteristics have come out of Finland. Ruskovaara and Pihkala (2013) studied 521 high school teachers in Finland to determine classroom practices used in entrepreneurship education. They found practice varied based on teachers’ perception of their own entrepreneurship competency (Ruskovaara & Pihkala, 2013). The most frequently used methods were “discussions about current financial news, the effects of different financial measures, and entrepreneurship related to the subject taught” (Ruskovaara & Pihkala, 2013, pp. 208-209). Many teachers used stories about entrepreneurs and entrepreneurship related teaching materials, but few used visits to business (Ruskovaara & Pihkala, 2013). Teachers who had attended training on entrepreneurship education were more likely to take an active approach to implementing active learning strategies to their own entrepreneurship education courses (Ruskovaara & Pihkala, 2013). “Teachers who took part in training were three to four times more advanced in their use of entrepreneurship education methods” (Ruskovaara & Pihkala, 2013, p. 212). Finally, they found that teachers who felt they had no entrepreneurship education skills used more abstract teaching methods such as discussion whereas teachers who perceived they had more advanced skills used more challenging methods such as projects, entrepreneurship games, and discussions based on the economy (Ruskovaara & Pihkala, 2013).

Seikkula-Leino, Ruskovaara, Ikavalko, Mattila, and Rytkola (2010) focused on the reflection practices of high school teachers in Finland. Through analyzing the reflective writing of teachers about entrepreneurship education, they found teachers were seeking coordination between subjects for implementing entrepreneurship education (Seikkula-Leino et al., 2010). Teachers also were confused between the goals and methods of instruction and had a limited scope of what constituted entrepreneurship education (Seikkula-Leino et al., 2010).
One study focused on teacher attitudes and intentions toward entrepreneurship education. Ali, Topping, and Tariq (2009) surveyed prospective teachers at seven universities in Pakistan on their entrepreneurial inclinations. They found the majority of pre-service teachers to have positive intentions toward entrepreneurship (Ali et al., 2009).

While more studies are needed concerning teacher characteristics for entrepreneurship education, some trends persist for the studies that were available. Generally, teachers’ personal characteristics did have an impact on what was taught as well as the degree of effectiveness of instruction in the entrepreneurship education classroom (Ruskovaara & Pihkala, 2013; Seikkula-Leino et al., 2010). Further, teachers appeared to be open to the prospect of teaching entrepreneurship (Ali et al., 2009).

**Purpose**

Entrepreneurship can be a great way to attract more young people into agricultural careers. The broader purpose of this research was to explore exemplary rural youth agricultural entrepreneurship education programs in the U.S. Specifically, the objective of this study was to describe key teacher characteristics in these exemplary programs. The outcomes of this research have implications for preservice and inservice teacher education.

**Methodology**

This study used a case study design. This study consisted of three separate case studies from the United States. Case study research involves defining a case set within a bounded system (Creswell, 2013). A case is bounded in that parameters of time, place, or physical boundaries are put in place to define it for research and description (Creswell, 2005). Case studies are “intensive descriptions and analyses of a single unit or bounded systems such as an individual, program, event, group, intervention, or community” (Merriam, 1998, p. 19).

**Case Selection**

Cases selection began by seeking geographic diversity through reaching out to a broad group of representatives from the National FFA organization Local Program Success, the National 4-H Council, leaders of non-profit organizations focused on rural youth engagement, faculty at universities, and state FFA staff to gain a better picture of the current status of rural agricultural entrepreneurship education. Many states were recommended, but the states of Texas, Nebraska, and North Carolina were frequently suggested. These states were ultimately selected because they represent: (a) geographic diversity, (b) a variety of total state populations, and (c) ultimately would yield the maximum diversity of perspectives given the very narrow parameters initially established to identify target states.

State leaders in these three states were asked to nominate ten programs meeting the following criteria: (a) program participants are youth between the ages of 15-24; (b) agriculture is the context for teaching entrepreneurship; (c) the majority of participants live in rural communities (less than 2,500 people; USDA, 2013); (d) the program is co-curricular or extracurricular and program participants must be full time students in some form of formal education (either secondary or vocational school); (e) at least 75% of students are engaged in entrepreneurial activities; and (f) the instructor is actively teaching entrepreneurship.

Ten programs in Texas, nine programs in Nebraska, and ten programs in North Carolina were initially identified by those states’ respective leaders. Contact was made with each of the
program teachers via electronic mail establishing a time for a phone interview. The researcher conducted a phone interview with each of the program teachers to gather evidence that the program met the previously established criteria. Teachers who were uninterested in participating in the study were removed from the list. Several programs were also removed because although they had robust SAE programs, they were not actively teaching entrepreneurship.

Following the phone interviews, final consideration was given and ultimately three sites (one per state) were selected to include in this study. This was based on the likelihood of collecting necessary data to meet the purpose of the research and three distinct cases to examine (Merriam, 1998). With the programs selected, the teachers were contacted and dates for the site visit established. The programs and teachers were given pseudonyms to protect their anonymity.

Data Collection and Analysis

Data collection occurred through three-day site visits to each program by the lead researcher. All activities had IRB approval from [university]. Data included (a) semi-structured interviews with the teachers in each program; (b) semi-structured focus groups with students in the program, and (c) participant observation captured through field notes. Data for this study were analyzed using the constant comparative method as prescribed by Lincoln and Guba (1985). Data were analyzed using MAXQDA.

Teacher interview questions focused on: (a) the personal background of the teacher, (b) teacher perspectives of the importance of teaching entrepreneurship, and (c) the entrepreneurship backgrounds of the teachers. Student focus group questions focused on how the teachers taught entrepreneurship. Direct observations from the researcher focused on evidence of what contributed to teacher effectiveness in teaching entrepreneurship.

Trust and Rigor

Multiple sources of data were used in this study to corroborate findings and were used as a form of triangulation (Merriam, 1998). Generally, the more time spent in the setting of the study the more likely it is that the researcher will be able to accurately reflect the reality of the local situation. Research was gathered over three consecutive days on site with multiple hours spent each day interviewing or observing. Next, reflexivity, or issues of the researcher’s personal bias obstructing the data, was limited through extensive memoing between the lead researcher and a second off-site researcher. Finally, member checking, or presenting initial findings to the participants to check that their responses were understood and recorded properly was used at the conclusion of every interview and focus group. Additionally, on the final day, a more thorough debriefing session with the teacher was held in order to summarize initial findings in a more holistic manner. As a final form of member checking, a draft of the final case study was e-mailed to each of the primary teachers for verification of accuracy.

Subjectivity Statement

At the time this research was conducted, I was a PhD student at [university] and a former agricultural education teacher, teaching in the U.S. and in Africa. Several pieces of my history lead me to a possible pro-entrepreneurship bias. From a young age my family’s cattle ranch served as a source of identity for me as I watched my uncle find his niche marketing cattle first in the show industry and later in registered cattle genetics. My father started his own construction business when I was in high school at about the same time I went into partnership with my sister in purchasing a small herd of cattle. Years later, my wife and I started a speaking and facilitation
company. In hindsight, I now recognize that even the draw to stay on as a volunteer at the school in Africa was due, in part, to my draw to the socially entrepreneurial spirit of the school’s director. In general, I recognize that I have a pro-entrepreneurial bias.

**Findings**

**Case 1 – Clarkstown, TX**

Three enthusiastic teachers were teaching agricultural education at Clarkstown High School. Ms. Johnson had been there the longest at 19 years, followed by Mr. Williams and finally Ms. Brown. While data were gathered from all three teachers, the majority came from Ms. Johnson. As such, findings for this portion are primarily reflective of her responses. Ms. Johnson taught the foundation courses, so a vast majority of students had taken at least one course from her. Further, at the time of data collection, she was teaching two primary courses of interest: entrepreneurship and foundations of AFNR (Field notes, day 1). There was significant overlap of content and practice between Ms. Johnson and Ms. Brown. Ms. Brown taught two courses of interest to this study: agricultural business management and food processing (Field notes, day 1). She was responsible for managing the meat market, which was deemed to be a primary training ground for entrepreneurship (Field notes, day 1). Mr. Williams was determined to fall outside of the scope of the study, and was not included in the data collection. His coursework focused on agricultural mechanics and fabrication and floriculture were thought to be outside of the scope of entrepreneurship (Field notes, day 1). Further, Mr. Johnson was not readily available for data collection. The survey instrument was completed by Ms. Johnson and Ms. Brown and their results are summarized below.

Ms. Johnson and Ms. Brown had different backgrounds. One had been teaching for 19 years and had a master’s degree. The other had been teaching for three years and held a Bachelor’s degree. Both were female and described themselves as living in a rural setting.

Ms. Johnson was an award winning, well liked, and very successful teacher from a family of educators (Field notes, day 1). An award bearing her name as the recipient for both the High School Teacher of the Year and an award for “exemplifying progressive leadership” hung in the main office of the school (Artifact 1). Her father had been the agricultural instructor at Clarkstown for forty years and she spent the first years of her career teaching with him (Field notes, day 1). She also had an uncle who was a professor of agricultural education. Her primary focus was on trying to get many opportunities for her kiddos (Field notes, day 1). She described herself as “a teacher first and an ag teacher second” (Field notes, day 1).

Several themes surfaced for the teachers at Clarkstown from interviews, observations and artifact analysis. Specifically, Ms. Johnson felt entrepreneurship was best done after gaining personal experience, that students should feel successful, and that collectively, the teachers were open minded and enthusiastic.

**Personal business experience.** Ms. Johnson had a family member who had been an entrepreneur. Her father had sold real estate and auctioned since she was in the sixth grade (Field notes, day 1). He continued to sell real estate in the area (Personal observation).

**Entrepreneurship after experience.** Ms. Johnson saw students’ future entrepreneurial endeavors as best suited after they gained experience working for someone else. In a personal interview, she said,
I think that if those kiddos go off somewhere and get some world experience or some bigger life experience maybe even college or on the job training, they would be more successful if they came back in the next couple of years when the population was larger and there was maybe more demand for their business.

The continuation of a business directly out of high school, she felt may be too small-scale to sustain a students’ livelihood. Ms. Johnson went on in the personal interview to say,

Several of them have seen some opportunities to start their own business and have been very successful at that. Kind of at a low scale. But, you wonder, is that something that can continue to thrive? I mean, a sophomore in high school that has his own lawn mowing business, what does he do as a graduate? Does he continue that? Or does he… I would assume it would need to be at a larger scale. Because for him to make a livelihood of that outside of high school, I don’t know that there’s that many yards to be mowed. But, if there’s more homes and a residential area to come, that would grow. So, that’s kind of what I’m seeing is that it’s going to take more growth in Clarkstown for them to be more successful with their own business.

The current population of Clarkstown, coupled with the small scope of most student projects, would likely yield limited growth opportunities for student entrepreneurial ventures as a full time occupation (Personal interview).

**The program is for more opportunities for more students.** Ms. Johnson viewed the purpose of the agricultural education program as to provide opportunities for as many students as possible. She said,

It’s a huge part of our community. The Clarkstown FFA program is a staple for the community; it’s a staple for the high school. The lab and the meat market are a jewel, a crown jewel for the school, and the community. There’s a lot of pride in that. And, it brings people to Clarkstown…It’s, sometimes, it’s bigger than me. It definitely is. As I see my own children start to be old enough to be, you know talk about a third generation to go through the program, it’s real important for me to continue to the high expectations that we have for our students. (Personal interview)

She said her vision for the program in the next few years was to “put another teacher at the middle school that would teach 7th and 8th grade and pull my Ag teachers back to the high school so we could continue to offer more up here” (Personal interview). She viewed the program as being a resource to the community that would offer more opportunities to more individuals.

**Students should feel successful.** Agricultural education has many different opportunities to help a student find success, according to Ms. Johnson. About students’ feeling successful, she said,

But out here [in the agricultural education program], we have the opportunity to really figure out where the talent is, and their interest, and plug them into a spot and they get success and that’s what it’s all about. That is the big picture to me. Whether a kid is urban or rural, it doesn’t really matter. But, in Clarkstown, we want our kids to be successful. They’re amazing kids. Very respectful. We’re blessed to get to come every day and teach. I know in other schools they herd cats
and keep fights on the down low. I get to teach every day and work with outstanding young individuals and push them to their own limits that they did not even know they had and have them experience success and that is the paycheck for me. (Personal interview)

Open-minded and enthusiastic. Students described their agricultural education teachers as being enthusiastic and open to the students being engaged in avenues beyond the scope of the agriculture program, so long as the student felt successful. Joe said,

I like the teachers. There’s more like a family associated. It’s not like just come to school learn and go home. There’s more like a family oriented atmosphere here. Like, Ms. Johnson, I feel like the mom in her comes out and she tells us to behave and just like advises us like in a parentally way. Instead of like down there [the main school building] it just feels like a real monotone, straightforward just get to the point thing. Here we can mess around and have fun. With the teachers, it’s…I like it a lot more. And they make it more, not fun, they make it more desirable to challenge ourselves because we can get more stuff done that way with them. We can learn a lot more things with them. I’m not a speaker, I don’t like it. But they’ve been, they’ve helped me open up and not be so shy. (Personal interview)

Students described their agriculture teachers as always pushing them to be better. One male participant from focus group three said, “If they can see that we’re going to be successful in that, then they’re going to push us. But, if they don’t see that we have that drive for that, they’re not going to push us.” Students felt the agriculture teachers would support them even in activities outside of the agricultural education arena. A male from the third focus group said,

like when it comes to other activities. Like [STUDENT] is in dance and they encourage it. They don’t say, oh, you can’t make it to this. They encourage it and say oh, that’s alright, let’s find something else. They’ll work with you on whatever you want to do in life.

Overall, students felt their teachers were open minded and enthusiastic (Personal observation).

Case 2 – Prairie View, Nebraska

Prairie View High School had one lead agricultural teacher, named Mr. Reed, a co-FFA advisor, named Ms. Collins, and a volunteer welding instructor named Mr. Green. Mr. Reed had been teaching for fifteen years, ten of which had been at Prairie View. He held a Bachelor’s degree in animal science and gained his teaching certificate after cattle ranching and farming cash crops for over a decade. Mr. Reed was responsible for teaching all of the agriculture coursework, supervising student SAEP, and serving as the co-FFA advisor. Even though he had recently had ankle surgery and walked with a bit of a limp, it didn’t seem to have slowed down his enthusiasm for the program (Field notes, day 1). Ms. Collins was the school guidance counselor and had been the co-FFA advisor since the inception of the FFA program at Prairie View in 1990. In addition to these responsibilities, she taught chemistry, anatomy and physiology, and a career education class (personal interview). She held a Master’s degree in counseling. She came across as very warm and competent. Finally, Mr. Green was a local business owner who volunteered at the school as the assistant welding instructor for the past fifteen years (Field notes, day 1). Mr. Green held a Bachelor’s degree in agricultural education, but had never been hired as a teacher. He owned
several businesses in town, one of which was a welding shop. As he was a volunteer, Mr. Green is not included in any further discussion.

Several themes surfaced for Mr. Reed and Ms. Collins from interviews, observations and artifact analysis. Specifically, they had the philosophy that success breeds success and that students should feel successful, their encouragement, and that the belief in the three ring model of agricultural education.

**Personal business experience.** Mr. Reed had previous business experience in agriculture. He had a cow calf operation and farmed for over a decade prior to gaining his teacher licensure. Further, he still owned the land he farmed and leased it out. He felt the practical experience he gained from this previous career had positively influenced his ability to teach subjects such as animal science and agribusiness.

**Our mom and dad advisors are encouraging.** Many students described Mr. Reed and Ms. Collins as encouraging. One male participant from the first focus group described Mr. Reed as encouraging his students to do their best. “So, if he [Mr. Reed] sees that you’re not really fulfilling what he knows you have he’ll try his hardest to make you be better. A female focus group participant from the first focus group described them as mom and dad stating “they share the duties.” A female from the second focus group added that the advisors encouraged students to “find ways to incorporate the entrepreneurship into everybody’s different SAE.” Students’ felt Mr. Reed had high expectations that he encouraged students to live up to (Male participant, focus group 3). Another male participant from the third focus group added that Mr. Reed encouraged them to try new things. He said, “He’ll [Mr. Reed] kind of encourage you to do it and give you reasons why he thinks that you are suited for it.” These forms of encouragement seemed to work with the students as they seemed to have good relationships with both advisors (Personal observation).

**Open to new ideas.** Students described the advisors as being open to new ideas. One female from the first focus group described it as

> They’re just very open to ideas, like very susceptible. Like, if you have an idea, some people might look at you like you can’t do it because of your age, or you can’t do it because you’re a girl, but they’re always really open and positive. They’re always reinforcing like good feedback. Like you can do it. And giving you different ideas about how you can make it happen and if you need help, I’ll be there. They’re very flexible with their schedule and yours so like if you need help they’ll set up a time and they’ll help you. They’re just kind of always there, like I don’t know, they’re kind of like parents I guess of FFA. So, whatever you need, they’ll be there and they’ll help you and they won’t criticize any of your ideas that you want to do.

Other students echoed this openness to ideas through conversations they would have with their teachers concerning SAEP ideas or other projects (Field notes, day 1).

**Accommodating and knowledgeable.** Several students had formed a chicken cooperative that was located at Mr. Reed’s house. The students generated the idea, got all of the permissions, and solicited all of the materials. However, they lacked the location to set up their enterprise. A male from the second focus group described it as, “Like if you don’t have anything, he tries to help set you up with like, your guys class, he helped you do chickens because some people didn’t really have a job. So, he’ll help you out in many different ways.” Mr. Reed assisted in all parts of the chicken operation. A female participant in the program from the first focus group said he had helped
them develop schedules and hosting the facilities at his place. She said, “Because we didn’t have any place else to put it and he was like, yeah, you can put it at my house.” Both advisors were knowledgeable and very helpful in offering advice to the students (Female participant, Focus group 1). Another female from the first focus group added that if a student wasn’t able to make it out there to feed due to overscheduled calendars, or other reasons, “if you would give them a call, they would be more than happy to help us out.” So, the chicken cooperative served to showcase Mr. Reed and Ms. Collins’ accommodating attitudes and knowledge of running a successful poultry operation.

**Hint, don’t tell.** Mr. Reed and Ms. Collins approached offering advice to students through questioning and hinting suggestions to them, not directly telling them his opinion. A female from the first group put it as, “Like, you might have an idea and then they’ll help you with it or they might like hint at something and then you’re like, oh, we can start this. And then they kind of help you make it prosper.” Students did not seem put off by this, but rather appreciated being given the space to come to their own conclusions.

**Success breeds success.** Mr. Reed’s general philosophy is that he tries to do anything "all to try and get students to be successful." (Memo) He stated more than once that success breeds success (Field notes, day 1). It seemed that success for him, and his students, came in the form of established SAE, proficiency awards, and LSE’s (Personal observation).

**Three ring model.** Mr. Reed modeled his program after the national model, which consisted of classroom/laboratory instruction, SAEP, and active membership in the FFA. This has been typically known as the three-ring model. About this, he said in a personal interview,

> Well, I guess I’m a firm believer of the three ring approach of the ag ed program. To me, I think outside of an ag program the big circle is FFA. Everybody wants FFA but they don’t really understand. They may understand well you have to have an ag teacher, that’s getting better as whole, people are understanding that. But, I think the SAE component if you don’t manage it, and you don’t get kids and families and parents and administration community to buy in to that SAE component, it will shrivel up and it will, you’ll just have a two circle program. And I don’t think that, I’m a firm believer that kids will learn more outside my classroom than they will inside the classroom. But, I put that seed there that, hey, there’s an opportunity of what you’re doing outside of the classroom for achievement and recognition. That’s why I’m such a firm believer, you know, of SAE.

SAE was strongly promoted through classroom instruction, course materials, and a culture that was apparently spread between students and within the community (Personal observations, Field notes, Artifact 1).

**Rural Nebraska has opportunities.** Both Mr. Reed and Ms. Collins expressed the faith that rural Nebraska was loaded with opportunities for young people. Mr. Reed was talking about his opinions on SAE and proficiency areas when the topic of babysitting came up. He said he did not encourage students to fill out the proficiency award for babysitting. Then, he stated, “That doesn’t say that that’s [babysitting] not a worthy and legitimate enterprise, but I just think in rural Nebraska, where live, there are opportunities” (Mr. Reed, personal interview).
Case 3 – Beautiful Hills, NC

Agricultural education is taught at Beautiful Hills High School by three instructors: Mr. Miller, who served as the main informant, Mr. Hill, and Mr. Turner. They all taught agricultural courses, shared supervisory responsibilities for SAEP, and co-advised the FFA. Mr. Miller had been teaching for 12 years, all at Beautiful Hills and held a master’s degree. He had been a former state FFA officer for North Carolina and came from what he described as being a successful FFA program. Mr. Hill had been teaching for ten years and held a master’s degree. Mr. Turner had been teaching for three years and held a Bachelor’s degree. He had recently transitioned from natural resources and ecological management into education. The three teachers appeared to have a good working relationship and very fluidly shared their responsibilities with one another. Mr. Miller and Mr. Hill were on twelve-month contracts, whereas Mr. Turner was on a ten-month contract.

Mr. Miller was very likeable, fast paced, and busy (Field notes, day 1). He had a self-described “do first and ask forgiveness later” personality who thrived on competition (Field notes, day 1). Every observation day was fast paced, with little down time (Field notes, day 2).

**Personal business experience.** Mr. Miller had been selling organic vegetables for several years (Field notes, day 2). He commented that if he were not teaching, he would be doing something in the horticulture industry such as running a greenhouse (Field notes, day 2). He was also peripherally involved with his in-law’s business as well (Field notes, day 2).

**Advise, don’t tell.** Students said one of the things they liked about their advisors was their advisors had a tendency to suggest ideas to students, without telling them outright what to do. A male participant from the first focus group described his advisors as saying things like, “have you considered.” He went on to say, I mean they don’t push anything on you, they just try to give recommendations that they think would help better you…” Another male participant of the first focus group described a hypothetical interaction between a student and Mr. Miller,

Like [Mr. Miller] will come up and [male student] has an awesome project going right now, and he’ll just kind of look at you and say, “How’s the project going? Have you done this lately?” and he’s on top of it. “Have you checked the pH of this” and he’d be like “Yeah, I did that yesterday.” And he just makes sure he’s on the right path, but he lets him explore new things that like [Mr. Miller] didn’t tell him to do.

Students indicated all their teachers practiced this advice-giving mode. One female from the first focus group put it as, “…like [Mr. Miller] and [Mr. Hill] and [Mr. Turner] do to us, recommend things. ‘Are you sure you want to do this? Why don’t you try this?’ like, just get them [other students] out of their comfort zones and just being able to offer advice.”

Another dimension of the advise, don’t tell theme, was that students felt as though their teachers gave them freedom. One male participant from the first focus group said, “They just kind of let you run with it…they do [monitor you], but they don’t really control you … they just kind of let you do what you want to do and see how it unfolds in your favor.” Students seemed to have a great deal of personal autonomy at all times (Personal observation). Mr. Miller said they just knew where the boundaries were, and he could trust them (Field notes, day 2).

**If you’re interested.** Advisors seemed to send the message to students that they would do anything within their power to help them regardless of what they happened to be, so long as the student was interested (Personal observation). A female participant from the third focus group
described it as, “they’re not going to force you.” A male from the second focus group described it as, “like the ag teachers are very supportive about your opinions about something you want to do.” The teachers seemed to want the students to take the initiative on individual projects. Then, when they did, the teachers would help as much as possible. Mr. Miller wrote, in an email follow up to my visit,

I feel that it is very important that we try and challenge students to think about ways that they can take their interests and try to parlay them into a career or business. This for me is a key to students being productive in their communities because when you are happy with yourself and your "job" then it seems you feel like you can be more involved in civic organizations and the world around you. I also feel that it is important that we try and spark entrepreneurial spirit to challenge students to come up with new ideas that will positively change the world around them. I teach what I think is the future leaders of our world and with that in mind I feel that it is important that I build their self-confidence so that when an opportunity presents itself they are prepared to meet the challenge with open arms. (Mr. Miller, email)

A male from the third focus group said many students requested taking agriculture classes from the guidance counselor, whereas for some students, it’s just a spot. This student said the agriculture teachers, “So, they’ll pay more attention to the people who actually want to be in that class and take that into their future career and put more attention into them. But, they will still help the other people.” Expanding on individual student’s interests could readily be seen through such examples as students in class research projects and student’s SAEP (Personal observation).

Knowledgeable. Agriculture teachers were very knowledgeable in their respective content areas as well as advising FFA events (Personal observation). Students described their teachers as being able to “expand my knowledge” (Male participant, focus group 2). A male from the first focus group said,

[Mr. Miller], he just got outstanding teacher of the Southeast region. I mean, you’re going to trust him more than somebody who’s just now starting out and I mean they’re fresh out of college. All of our advisors know just about anything you want to ask them and if you need something they’ll put you where you need to be to get it and then they’ll tell you how to do it and then I mean they just make life easier for all of us.

These sentiments of trusting teacher’s knowledge and competency carried through to many student interactions and could be seen during early morning CDE practices as Mr. Miller taught students how to understand soil horizons and late afternoon SAEP visits as former members expressed gratitude for the advice they had received on their tomato enterprise (Personal observations and field notes, day 1).

Passionate. Some students appreciated the passion for the job that their teachers showed. One male participant from the first focus group said he had observed other ag teachers that just didn’t care about their jobs. However, of his teachers, he said, “But, in the three we have, it’s not just a job because if they just showed up just to get paid, they wouldn’t spend the amount of time they spend after school and before school and even during school...” That student went on to say he felt the teachers actually cared about their students and were just looking out for them (Male participant, focus group 1). A female participant from the third focus group talked about Mr. Turner’s passion for engaging students. She said she struggled to understand some student’s apathy.
This student said he was working hard to engage them both in and out of class (Female participant, focus group 3).

**Approachable.** Agriculture students at Beautiful Hills High School seemed to think their agricultural teachers were approachable. Many could be seen down in the ag building during breaks simply visiting casually with their advisors (Personal observation). A few of the many quotes from students were:

“You walk up to them and talk to them like your family or you’re really close friends” (Female, focus group 1).

“They’re really like down to Earth.” (Male participant, focus group 2).

“…they’re fun to be around” (Female participant, focus group 2).

“…they can relate…to us more” (Male participant, focus group 3).

“They speak to us like we’re people” (Female participant, focus group 3).

“It’s never a thing of authority with them” (Female participant, focus group 3).

“We all respect them a lot” (Female participant, focus group 3).

Generally, students seemed to have a good relationship with their agricultural teachers based on their approachable personalities.

**Individualization.** Many students seemed to think that their teachers offered individual attention and advice. Personal advice was offered while working on projects or outside of class time based on the fact that, as one female participant from the third focus group said, “we have personal connections with them all, and they’re all very different. So, they know us really well.” A male from the third focus group felt his agricultural teachers gave individual help if you needed it. A female from the same focus group said, “They know what will work, and help tailor to our needs.” Even though there were well over 200 students in the program, the advisors seemed to know and connect to each one on an individual basis (Personal observation).

**Conclusions**

From this study, it can be concluded that teachers from within the three cases evaluated shared five characteristics. In no particular order of importance, those characteristics were that the teachers were experienced, held advanced degrees, had prior experience with entrepreneurship, generally were considered outstanding teachers, and were described as being open minded and enthusiastic. Perhaps the key distinction between these teachers and other excellent agricultural education teachers was their prior experience with entrepreneurship.

**Experienced**

All of the teachers of primary focus for each case had over a decade of teaching experience, with the average years of teaching experience being over 15 years. Since entrepreneurship is inherently risky, it may be that teachers need enough time to become comfortable with their roles to begin branching, or advising students to branch, into more entrepreneurial ventures.

**Advanced Degrees**

Two of the three primary teachers at each school held masters degrees. However, arguably the most entrepreneurial case from Prairie View, Nebraska, had a lead teacher with only a Bachelor's degree. So, while it is a noteworthy point of comparison, it is the opinion of this researcher that this is a relatively small factor.
Prior Entrepreneurial Experience

All of the primary focus teachers had some prior or ongoing personal experience with entrepreneurship. Arguably, Ms. Johnson had not had direct experience with entrepreneurship. However, coming from a family of entrepreneurs no doubt had an influence on her. Mr. Reed had the most extensive history of business operation with his farming and ranching experience. However, Mr. Miller had an ongoing involvement with the sale of organic vegetables.

Generally Outstanding Teachers

There is little doubt that all three teachers were simply excellent teachers. They had been recognized within the state and nation as being exceptional teachers. They were progressive in their teaching pedagogy and knowledge base. It may be that as outstanding teachers, they recognized a need for entrepreneurship, in addition to myriad other needs for their students, and took strides to fill the gap.

Open-Minded and Enthusiastic

Collectively, all teachers had themes somehow related to being “open-minded” and “enthusiastic.” The programs had a paradoxical balance between high expectations and tightly run policies and procedures with the flexibility to let students explore, especially through their SAE. This tight/loose paradox came across to students as the teachers being open-minded to the students trying new ideas with their SAE, as well as during classroom and laboratory instruction. Students universally found their teachers to be enthusiastic in their teaching style, as well as when offering student advice.

This study aligns with others that indicate teachers teach what they have experienced and feel competent to teach. Ruskovaara and Pihkala (2013) found Finish teachers practice varied based on their perception of their own entrepreneurship competency and the perception teachers had of their own entrepreneurship education skills closely connected to the implementation of entrepreneurship education.

Recommendation for Teachers

Find youth entrepreneurs. While much is known about the characteristics of entrepreneurs, the specific manifestation of those traits in students may be obscured. Student with a strong aptitude for entrepreneurship may not be immediately evident in a traditional school setting. Teachers need to understand that these students may not be their top academically performing student, or possess other traits that one would be looking for in a traditional definition of a successful student. However, it is likely that students with a strong potential for entrepreneurship success exist in their classrooms. Those students should be identified and their propensity for entrepreneurship encouraged.

Work with the local entrepreneurial ecosystem. While the United States generally has a favorable ecosystem for entrepreneurship, the local ecosystem within the three cases represented by this study varied dramatically. Teachers should, at minimum, understand that the local context where they teach will be unique and will vary on the favorability it offers toward youth entrepreneurship. This does not mean that nothing can be done for offering entrepreneurship education in an unfavorable ecosystem. Rather, teachers should recognize the strengths and weaknesses the local context offers and work to help aspiring student entrepreneurs work within their given community’s constraints.
Be enthusiastic and open-minded. The teachers in this study were enthusiastic, not only about entrepreneurship, but also generally about helping students succeed. The scope of their vision extended beyond the bounds of their discipline. All three shared a passion for watching their students succeed in activities the students found meaningful and enthusiastically made strides to help their students achieve. The teacher’s open-mindedness created an environment where it was okay for students to try new ventures. While the teachers would make suggestions and offer advice to students concerning ongoing activities or their SAE, it was ultimately the student who took ownership and the direction of their efforts. So, teachers should work to develop an enthusiastic, open-minded approach to their careers.

Engage students through their SAE to identify ways to incorporate entrepreneurship. First, teachers in this study took a strong, proactive approach that emphasized SAE in their respective programs. Second, teachers worked within the system of SAE to move as many students as possible to an entrepreneurship type of SAE. While entrepreneurship can mean simply owning a single animal to show at a local fair, these teachers were also advising students with innovative entrepreneurship SAE. Encourage innovation within entrepreneurship type SAE.

Develop communicable outcomes for entrepreneurship education. There are many competing goals and potential outcomes for school based agricultural education across the nation and within a local community. Entrepreneurship education did not appear to be a primary focus for any of the programs within this study. However, teachers within these programs were able to articulate the intended outcomes to varying degrees concerning the entrepreneurship education dimension of their program. Should a teacher of agriculture decide that entrepreneurship should become an area of focus within the program, it is important to be able to communicate the intended outcome for that particular domain. Teachers within this study tend to consider developing entrepreneurial mindsets within students to be a worthy outcome, and consequently take programmatic efforts to make that happen.

Imbed entrepreneurship in practice through experiential learning. Experiential learning has been used in a variety of contexts to facilitate engagement and learning in entrepreneurship education. Teachers within this study used classroom experiences such as having students write a business plan, pitching their business ideas in a Shark Tank style presentation, and using scenarios to think critically about real world examples of situations entrepreneurs may find themselves in. A student’s SAE is also an experience and may be used as a learning tool if done properly. However, there is almost limitless opportunity to enhance instruction through experiential learning activities and practice for entrepreneurship education in a SBAE context.

Work with students to identify and overcome barriers to entrepreneurship and ways to break down the barriers. Students in this study recognized barriers to initiating an agriculturally based entrepreneurship firm. Land access, capital, and generational transfer of assets are relatively universal issues youth in agriculture will face. No doubt these may be major hurdles for students to overcome. However, teachers can facilitate solutions to these issues either directly, or by introducing students to other entities that can help, such as banks, non-profit organizations, or government entities.

Consider what does, and does not, influence student’s career decision. Students in this study were consistent in identifying what they thought did and did not influence their career decisions. Love of the career and the ability to succeed in the career were two of the top three career influencers in all three cases, with personal goals being one of the top three factors in two of the three cases. Teachers can capitalize on this, especially if they are trying to encourage students to consider entrepreneurship as a career option. Entrepreneurs are passionate about their careers and
exhibit other characteristics that may align with student’s interests. Teachers in this study practiced individualized attention for their students. While positive peer pressure was used, as was especially evident in the case of the pod system in Prairie View, teachers in this study did not show evidence of trying to use peer influence or perceived social status as motivators for students.

Grow your own affinity for and understanding of entrepreneurship. They had previous experience with entrepreneurship. They generally exhibited an innovative spirit and a willingness to try new things. Teachers hoping to enhance entrepreneurship education at their school should, in effect, become more entrepreneurial, or at least take steps to understand entrepreneurship and the way entrepreneurs operate.

Offer wrap around services for student entrepreneurs such as financial services or more formalized mentoring with business leaders. Students in this study identified family members and occasionally community members as serving a mentoring role. Additionally, one of the advisors from the Prairie View School thought they should try to connect students to business leaders more directly. Teachers of agriculture can serve a brokering role between students and services that will help them be successful as young entrepreneurs. As with the suggestion of solving barriers, teachers can try and facilitate this directly, or outsource the wrap around services to an affiliate group, such as their Alumni. However, it is accomplished, wrap around support services may help aspiring young entrepreneurs to be successful.

**Recommendation for Teacher Educators**

Provide an environment for pre-service teachers to gain entrepreneurship experience. All the teachers in this study had some prior experience with entrepreneurship, either directly or through a family member.

Offer professional development in entrepreneurship. A dearth of teaching resources for entrepreneurship education exist (e.g. Daniel & Kent, 2005) and could be adapted for an agricultural education context. Ruskovaara and Pihkala (2013) found teachers who took part in entrepreneurship education trainings were three to four times more advanced in their use of entrepreneurship education methods.

Help teacher candidates understand the differing entrepreneurial ecosystems they may face. Teachers in this study had adapted to meet the needs of their local communities, despite differences.

Imbed entrepreneurship education into existing curricula. Teachers from this study stated a need for entrepreneurship to be threaded throughout instruction, rather than a stand-alone topic.

**Recommendations for Future Research**

Future research should examine the teaching of entrepreneurship in different agricultural education programs. Although similarities were found in these three programs, differences were also noted.

SAE proved to be a valuable teaching tool for entrepreneurship. Future research should identify ways that entrepreneurship can be incorporated into, or enhanced through SAE. Entrepreneurship/ownership is an existing category for proficiency areas within the national FFA structure. Perhaps the current structures limit the innovativeness of entrepreneurship type SAE. Future research may need to explore the most effective means for approaching the entrepreneurship
domain within SAE, as well as adjustments to SAE that could further incentivize innovations within entrepreneurship type SAE’s.

Compare the entrepreneurial mindset of different groups of students. It may be that students with different previous experiences or different demographic backgrounds have different entrepreneurial mindsets. Exploring this would be informative to practitioners seeking interventions for these audiences.

References


Online Certificate Program Moves Participants to Advanced Stages of Concern for Social Marketing

Anil Kumar Chaudhary1, Laura A. Warner2 & Kathryn A. Stofer3

Abstract

Social marketing is an underused strategy that agricultural educators can employ to bring about behavior change. We designed an online certificate program for Extension professionals and other educators based on an identified need for social marketing professional development. The Concerns-Based Adoption Model (CBAM) served as the conceptual framework and stages of concern explained changes in concerns among Cultivating Community Change online certificate program participants. The purpose of the study was to describe participants’ stages of concern profile before and after the certificate program and identify how participants’ perceptions changed as a result of involvement in the certificate program. We collected quantitative data using the stages of concern questionnaire and qualitative data from participants’ open-ended discussion answers. Participation in the certificate program moved participants to advanced stages of concerns for application of social marketing in their work. The certificate program helped to broaden participants’ understanding and application of this technique and changed their perceptions positively toward social marketing. We consider the certificate program successful, and we recommend agricultural education professionals use online certificate programs to build Extension professionals’ and other educators’ skills to change behavior of their target audiences.

Keywords: evaluation; nonformal education; online certificate program; social marketing; stages of concern

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Introduction

As reflected in the American Association for Agricultural Educations’ current research priorities (Roberts, Harder, & Brashears, 2016), the agricultural education profession is distinctively positioned to address today’s complex problems, which include food security and water scarcity. To solve complex issues on a global scale, agricultural education professionals are encouraged to go beyond increasing their audience’s knowledge and use strategies informed by the behavioral sciences to bring about “widespread behavior change” (Roberts et al., 2016, p. 59). One proven but underused strategy agricultural educators can use to bring about change is social marketing (Rogers, 2003; Warner & Murphrey, 2015).

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Social marketing is the application of commercial marketing principles and tools to education programs by developing strategies leading to the adoption of behaviors that benefit the individual, the environment, or the community to which they belong (McKenzie-Mohr, 2011; Rogers, 2003). Social marketing works by using extensive audience research to develop educational strategies presenting a behavior change such that it is acceptable and valuable to the audience, or makes an offer the audience members cannot refuse (Lee & Kotler, 2011; McKenzie-Mohr, 2011). As a strategy for behavior change, social marketing is compatible with agricultural and extension education because it is audience-focused and incorporates planned evaluation processes (Lee & Kotler, 2011; Warner, 2014).

Both Extension professionals (Warner, 2014) and social marketing experts (Warner, Stubbs, Murphrey, & Huynh, 2016) have described inadequate knowledge and skills among agricultural educators as barriers to applying social marketing within an agricultural education context. Informal science educators also have a continuing general need for professional development, particularly as a component of efforts to professionalize their discipline and to improve its members’ pedagogical knowledge (Tran & King, 2007, 2011). It is likely that similar needs apply to a broader array of Extension and other community-based educators, whether they are labeled non-formal, informal, or free-choice educators (Stofer, 2015). Bringing such educators together has the potential to strengthen collaborations and reduce redundancies in program creation.

Thus, professional development in the application of social marketing techniques and principles may be critical to addressing the complex issues addressed by Extension as well as other agricultural education and outreach professionals. However, very few opportunities exist for agricultural education professionals to seek professional development in the use of social marketing (Warner, 2014; Warner & Murphrey, 2015). For this reason, we developed an educational program to provide such development for Extension professionals along with other agricultural education and outreach professionals.

We selected an online education format because this approach potentially allows agricultural education professionals to provide more people with better education (Murphy & Terry, 1998), it is cost-effective (Nelson, 2008), and provides a self-paced experience for learners (Diaz, 2002). Online education provides a means to globalize agricultural education programs and “offers previously unimagined opportunities for collaboration and resource sharing” (Harder & Lindner, 2008, p. 69). Online education solves some of the barriers associated with in-class instruction and provides an attractive alternative to traditional educational methods (Bruce & Johnson, 2004; Harder & Lindner, 2008).

Online Certificate Program

Based on the need for social marketing professional development for a large number of educators and considering the advantages of online education, we designed an online certificate program. The certificate program consists of eight online modules, each designed to take approximately one hour to complete. Each module begins with introductory text outlining its objectives and corresponding activities. The main content is presented through a video presentation of no more than twenty minutes consisting of slides with voice-over narration. Other module components include text summaries of important concepts, knowledge quizzes, reflective discussion activities where learners are asked to apply the principles of the module to a program they would like to implement or revise to include social marketing, and a list of resources and references. Discussion activities allow learners from various disciplines and traditions to learn from similar experiences they might have not considered as having overlap with their own. Participants
access the certificate program through the University of Florida web site, which was opened for enrollment beginning in August of 2015.

The course begins with modules outlining the basics of social marketing in the context of Rogers’ (2003) diffusions of innovations. Consistent with our intention to integrate social marketing in Extension program planning, the latter half of the course describes integration of social marketing in the Extension program planning steps recommended by Boone, Safrit, and Jones (2002). For example, the first step in Extension program planning is planning, which includes designing objectives, creating a logic model, and understanding the audience. Our certificate illustrates ways to create logic models for social marketing programs and integrate traditional audience research results into the design of a social marketing campaign. Later modules describe the implementation phase of program planning by presenting the tools of social marketing, including communication, incentives, prompts, and commitment. The final module outlines evaluation of social marketing campaigns in the context of Boone et al. (2002) evaluation and accountability phase of program planning.

**Conceptual Framework**

We used the Concerns-Based Adoption Model (CBAM; Fuller, 1969) as the conceptual framework to evaluate potential success of the *Cultivating Community Change* online certificate program. The success was operationalized as advancement of participants to higher stages of concerns compared to lower stages of concerns for the use of social marketing in their work. Concerns towards an innovation can be defined as the feelings and perceptions of people about a specific innovation (Hall & Hord, 2006). We applied this framework to the current study by considering social marketing an educational innovation. With the introduction of an innovation, individuals may progress through a series of feelings and perceptions towards innovation in a developmental pattern, or an increasing progression of concerns, and this process is known as the stages of concern (Hall & Hord, 2006).

Fuller (1969) proposed that with an increase in experience with an innovation, potential adopters move through four levels of concern: unrelated, self, task, and impact. When people are unaware of the innovation they have no concern about the innovation (unrelated); once they are exposed to the innovation they experience personal (self) concerns as to how they are going to interact with the innovation (Fuller, 1969; George, Hall, & Stiegelbauer, 2013). When familiarity and comfort with the innovation increases, people begin to experience concerns regarding the specific use of innovation (task), and, finally, people are concerned about impact of innovation on their work or collaboration with others (impact; Fuller, 1969; George et al., 2013).

Building upon Fuller’s concerns theory (1969), Hall, George, and Rutherford (1977) proposed seven stages of concern. In stages of concern, stages indicate that individuals experience these concerns in a growing progression (see Table 1) where with exposure to and increased comfort with an innovation individuals move from lack of concern (e.g., Stage 0 – Unconcerned), to a low level of concern (e.g., Stage 1 – Informational), and so on to higher levels of concern, such as Stage 3 – Management (George et al., 2013), as they learn more about the innovation and its relevance to them.
Table 1

Seven Stages of Concern and Their Definitions

<table>
<thead>
<tr>
<th>Stage</th>
<th>Definition</th>
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<tbody>
<tr>
<td>Stage 0: Unconcerned</td>
<td>with limited exposure to innovation, little or limited concern indicated by an individual for the innovation</td>
</tr>
<tr>
<td>Stage 1: Informational</td>
<td>the individual at this stage indicates general awareness of innovation and exhibit interest to learn more about it, but the individual seemed to be little worried about innovation</td>
</tr>
<tr>
<td>Stage 2: Personal</td>
<td>the individual at this stage shows uncertainty about demand of innovation and concerned about how to meet innovation demands and role played by him/her with the innovation</td>
</tr>
<tr>
<td>Stage 3: Management</td>
<td>at this stage, the individual focus his/her attention toward process and task of using the innovation and how to efficiently use available information and resources</td>
</tr>
<tr>
<td>Stage 4: Consequences</td>
<td>the individual at this stage concerned about impact of innovation on his/her work and immediate sphere of influence</td>
</tr>
<tr>
<td>Stage 5: Collaboration</td>
<td>at this stage, the individual concerns move towards coordination and cooperation with others regarding use of innovation in his/her work</td>
</tr>
<tr>
<td>Stage 6: Refocusing</td>
<td>this is the final stage at which the individual focus on applying innovation to a broader scale, including overhauling the existing innovation or completely replacing the existing innovation with a new innovation</td>
</tr>
</tbody>
</table>

Note. Adapted from “Measuring implementation in schools: The stages of concern questionnaire” by A. A. George, G. E. Hall, and S. M. Stiegelbauer, 2013, SEDL, p. 8. Copyright 2006 by the SEDL.

CBAM posits that individuals’ feelings and perceptions towards an innovation change as they progress through the adoption process and become more comfortable with a new technology or approach (George et al., 2013; Hall & Hord, 2006). CBAM has been used extensively to understand the adoption of educational innovations and applied to a variety of settings and innovations (Hall & Hord, 2006). Hao and Lee (2015) used CBAM to understand concerns of middle school teachers in Taiwan to integrate Web 2.0 technology in their instruction. Similarly, Warner and Myers (2011) used CBAM to assess concerns of Florida agriscience educators in implementing content area reading strategies in their classrooms.

The emergence and resolution of concerns is highly personal and requires time to reduce lower levels of concerns and progress to higher levels of concerns (George et al., 2013). Understanding changes in the Cultivating Community Change online certificate participants’ concerns following participation in program could allow developers to design additional workshops, targeted consultations, and strategic plans to enhance the adoption of social marketing (Hall & Hord, 2006). We hypothesized that after completing the Cultivating Community Change online certificate program, participants would be more comfortable with applying social marketing to their work. We anticipated this would appear through resolution of their lower-level concerns (e.g., Stages 0-2: Unconcerned, Informational, Personal) and advancement to upper-level concerns (e.g., Stages 3-6: Management, Consequences, Collaboration, Refocusing) with respect to the impact, collaboration with colleagues, and universal application of social marketing to their work.
Purpose and Objectives

The purpose of this study was to identify changes in regard to concerns among the *Cultivating Community Change* online certificate program participants. The specific objectives were to:

1. describe the stages of concern profile of certificate program participants before they began and after completing the course; and
2. describe the change in perceptions of participants toward social marketing after completing the certificate program.

Methodology

Research Design

To achieve this study’s research objectives, we employed both quantitative and qualitative research methods (Creswell & Plano Clark, 2011). Primarily, data were collected using quantitative research methods and complemented with qualitative responses for additional context. By using both methods in our research, we were able to gain a deeper understanding of our research problem by collecting, analyzing, and interpreting the research findings using the principles of quantitative and qualitative research methods in a single research investigation (Creswell & Plano Clark, 2011). To meet the needs of the study, we used a convergent parallel design to “obtain different but complementary data on the same topic” (Morse, 1991, p. 122). This design allows triangulation of findings by comparing and contrasting findings from both quantitative and qualitative research (Creswell & Plano Clark, 2011). Among the convergent parallel design variants, we used the parallel-database variant, where data were separately collected and analyzed for both quantitative and qualitative approaches (Creswell & Plano Clark, 2011). We compared and synthesized the findings from two data sets during the discussion and conclusion sections of the study (Creswell & Plano Clark, 2011). On approval from the Institutional Review Board of the University of Florida, we collected data using a quantitative questionnaire and a qualitative, open-ended discussion board in the certificate program.

Sampling and Recruitment of Certificate Program Participants

The target population of the study was all professionals who work for promoting change in specific behavior of their target audiences. The respondents were the Extension professionals, agricultural education professionals, and other change agents who participated in the certificate program. The respondents were selected using non-probability sampling procedure because participants self-selected enrollment in the certificate program. The certificate program was advertised via postcard mailings and through Twitter to local, state, and national agricultural, energy, environmental, and science education and outreach groups such as the National Association of Agricultural Educators, Florida Museum of Natural History, the Association of Science-Technology Centers, the League of Environmental Educators in Florida, and the Association of Zoos and Aquariums. From August 2015 to November 2016, 162 participants started the certificate program and among them 155 (95.7 %) provided complete data on the study’s pre-test. At the time of this study 58 individuals had completed the certificate programs and 57 (98.3%) provided complete data at the end of certificate (post-test). Partial missing data existed for two cases each for both pre-test and post-test, which we managed using simple imputation to complete the missing entries with plausible values (Schafer & Graham, 2002). Due to participants’ anonymity, we were unable to match participants at the beginning and completion of the certificate program.
To quantitatively measure participants’ concerns regarding their use of social marketing, we adapted the Stages of Concern Questionnaire (SoCQ) questionnaire (Hall et al., 1977) by considering social marketing as the innovation. SoCQ has been regarded as the most rigorous, reliable, and primary tool to determine at what stage of concern an individual is regarding an innovation (George et al., 2013; Hall & Hord, 2006). The SoCQ questionnaire was composed of 35 eight-point, Likert-type scale items which were equally distributed (five items each) among the seven stages of concern. The eight-point scale coding ranged from 0 to 7 and examples of scale were 0 = this statement seems irrelevant to me, 1 = this statement is not at all true of me at this time, 4 = this statement is somewhat true of me now, and 7 = this statement is very true of me at this time. Example statements from SoCQ are reported in Table 2. In addition to 35 concern statements, the questionnaire also included five demographic questions asking participants’ age, sex, education level, state in which they worked, and the discipline of their primary work. The demographic questions were included only in the pre-test SoCQ questionnaire.

Table 2

Sample Items for Stages of Concern and Corresponding Cronbach’s Alpha Coefficients for Each Stage at Beginning (Pre-Test) and Completion (Post-Test) of the Certificate Program

<table>
<thead>
<tr>
<th>Concern stage</th>
<th>Pre-test Cronbach’s Alpha</th>
<th>Post-test Cronbach’s Alpha</th>
<th>Sample Statements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stage 0: Unconcerned</td>
<td>0.66</td>
<td>0.88</td>
<td>I am not concerned about the use of social marketing</td>
</tr>
<tr>
<td>Stage 1: Informational</td>
<td>0.83</td>
<td>0.88</td>
<td>I have a very limited knowledge of social marketing</td>
</tr>
<tr>
<td>Stage 2: Personal</td>
<td>0.76</td>
<td>0.88</td>
<td>I would like to know the effect of using social marketing on my professional status</td>
</tr>
<tr>
<td>Stage 3: Management</td>
<td>0.88</td>
<td>0.92</td>
<td>I am concerned about not having enough time to organize myself each day</td>
</tr>
<tr>
<td>Stage 4: Consequence</td>
<td>0.88</td>
<td>0.82</td>
<td>I am concerned about stakeholders' attitudes toward the use of social marketing</td>
</tr>
<tr>
<td>Stage 5: Collaboration</td>
<td>0.85</td>
<td>0.88</td>
<td>I would like to help other Extension educators in their use of social marketing</td>
</tr>
<tr>
<td>Stage 6: Refocusing</td>
<td>0.82</td>
<td>0.84</td>
<td>I am concerned about revising my use of social marketing</td>
</tr>
</tbody>
</table>

Validity of the SoCQ scale was established using correlation matrices and factor analysis and seven scales of the SoCQ measured seven independent constructs corresponding to seven stages of concern as proposed by CBAM (George et al., 2013). Several researchers have tested the...
scale for its internal consistency with a variety of innovations and found that Cronbach’s alpha coefficients were acceptable, i.e., 0.7 or above (Santos, 1999), for the seven stages of concern except in the case of Stage 0 (Bellah & Dyer, 2009; Hall et al., 1977; Hall, Loucks, Rutherford, & Newlove, 1975; Shoulders & Myers, 2011; Stair, Warner, & Moore, 2012; Warner & Myers, 2011). George et al. (2013) stated Stage 0 items have been under revision to improve their reliability. We calculated post-hoc reliability coefficient for seven stages of concern at both the beginning (pre-test) and completion (post-test) of the certificate program (see Table 2) and found acceptable Cronbach’s alpha coefficients (Santos, 1999) for all stages of concern, except Stage 0 – Unconcerned for participants who completed the pre-test.

We administered SoCQ to certificate participants twice in the form of a web-questionnaire, once before the start of certificate program as a pre-test and then on completion of certificate program as a post-test, and analyzed data using frequency and percentages. We created overall stages of concern profile at the beginning of the certificate program (pre-test, 155 participants) and at the completion of the certificate program (post-test, 57 participants) using the Microsoft Excel SOCQ–075 Graph and Print program (Scott & Persichitte, 2006). In the Microsoft Excel SOCQ–075 Graph and Print program, we summed the raw scores for items representing each stages of concern. Later, we converted summed raw scores for each stage of concern into percentile scores using George et al.’s (2013) conversion chart where “the percentile score indicates the relative intensity of concern at each stage” (George et al., 2013, p. 32). We interpreted higher percentile scores corresponding to higher concerns within a given stage. The percentile scores were not interpreted as absolute numbers, but were relative to scores of an individual or group at the other stages (George et al., 2013). For instance, the 55 percentile may have been the highest score and most intense stage of concern (e.g., Stage 1: Informational) for one group, it may be the lowest score for another group for a different stage of concern (e.g., Stage 3: Management). According to George et al. (2013), this conversion chart is well validated by different studies examining various innovations. For the interpretation of SoCQ data for a group, most commonly, overall stages of concern profiles are created (George et al., 2013). Concern profiles are visual line graphs representing mean concern intensities for a group of people.

Qualitative Data Collection and Analysis

We collected qualitative data through a discussion activity in the final module before the post-test. We asked participants to provide their views by answering one open-ended question: how has your perception about social marketing changed over the course of this program? A total of 52 (89.7%) participants provided a comprehensive response to this question, adequate for this level of analysis, as we did not aim for data saturation, only description of our population. We used content analysis of this text to describe participants’ beliefs (Creswell, 2005).

We did not have any expected themes but instead looked for themes that emerged from the data (Bogdan & Biklen, 2007). We analyzed themes using inductive analysis to establish meaning using the number of times dominant and significant themes emerged from the data (Thomas, 2006). The lead researcher first read the statements multiple times to become immersed and gain a sense of the data as a whole (Creswell, 2005; Hsieh & Shannon, 2005). After gaining a deep understanding of the data, the lead researcher derived codes (Zelaya, Harder, & Roberts, 2016) by reading the data line by line for each respondent (Creswell, 2005; Hsieh & Shannon, 2005). Later, the derived codes were examined for any overlap or redundancy and finally merged together to develop broader themes (Creswell, 2005). The study findings were reported using pseudonyms. To support transferability of qualitative research findings, we provided description of data collection context and reported the data using thick rich descriptions, including actual quotes from the respondents (Dooley, 2007; Lincoln & Guba, 1985). To establish dependability and trustworthiness...
of the study’s findings, we maintained audit trails to document all data analysis and reasoning procedures used to derive the final themes (Dooley, 2007; Lincoln & Guba, 1985). Finally, to establish credibility of the study’s findings, we compared qualitative and quantitative research results to assess alignment (Dooley, 2007).

Participants

Out of 155 participants who provided complete data on study’s pre-test, 153 provided response to demographic questions. The 153 participants represented 20 states of United States with the highest proportion (66%, n = 101) of participants from Florida. The majority (77.8%, n = 119) were female, and almost 42% (n = 64) had a master’s degree or more education. The average age of participants was 36.16 (SD = 11.87) years, and their primary discipline (see Table 3) was something other than the fields provided (37.3%, n = 57), followed by environment (26.8%, n = 41).

Table 3

Certificate Program Participants’ Primary Discipline of Work

<table>
<thead>
<tr>
<th>Primary discipline of work</th>
<th>f</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture</td>
<td>4</td>
<td>2.6</td>
</tr>
<tr>
<td>4-H and youth development</td>
<td>7</td>
<td>4.6</td>
</tr>
<tr>
<td>Environment</td>
<td>41</td>
<td>26.8</td>
</tr>
<tr>
<td>Family &amp; Consumer Sciences</td>
<td>5</td>
<td>3.3</td>
</tr>
<tr>
<td>Lawn and gardens</td>
<td>4</td>
<td>2.6</td>
</tr>
<tr>
<td>Sustainable living</td>
<td>22</td>
<td>14.4</td>
</tr>
<tr>
<td>Administration</td>
<td>3</td>
<td>2.0</td>
</tr>
<tr>
<td>Staff</td>
<td>5</td>
<td>3.3</td>
</tr>
<tr>
<td>Other, please describe</td>
<td>57</td>
<td>37.3</td>
</tr>
<tr>
<td>Horticulture</td>
<td>5</td>
<td>3.3</td>
</tr>
<tr>
<td>Total</td>
<td>153</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Results

Objective 1: Describe the stages of concern profile of certificate program participants before they began and after completing the course

A group concerns profile at the beginning of the certificate program (i.e., pre-test) revealed that the participants’ highest intensity of concern was in Stage 1 – Informational (93rd percentile;
see Figure 1). The second highest intensity of concern was Stage 2 – Personal (78th percentile). When examining participants’ group concern profile at completion of the certificate program, we found a somewhat similar pattern as the pre-test in terms of highest and second highest intensity of concern. However, we observed progress in the group profile at the completion of the certificate (post-test) program, suggesting participants’ concerns reduced regarding the first five stages and increased for the last two stages.

Figure 1. Group concerns profile of the *Cultivating Community Change* online certificate program participants at the beginning (pre-test) and end (post-test) of the certificate program.

**Objective 2: Describe the change in perception of participants toward social marketing after completing the certificate program**

Three major themes emerged describing change in perceptions of participants toward social marketing over the course of the certificate program. The themes were: social marketing is a complex process, skills and tools of social marketing, and improved understanding of the process. Next, we describe evidence of each of these three themes.

**Social marketing is a complex process.** Prior to start of the certificate program, participants underestimated the scope of social marketing and considered it a simple process. As a result of completing the certificate program, participants realized that social marketing is a very detailed, thoughtful, extensive, and scientific process. Joe stated, “upon learning about social marketing in greater detail, I realize that it goes very in-depth, and there are many different factors that play into a successful social marketing campaign.” Similarly, James stated, “over the course of this program I have learned what social marketing is and how complex and involved creating programs can be.” Jolly also stated, “I didn't realize all of the steps involved and tools available for
social marketing before taking this program,” and Emily reported, “taking this course has shown me the full extent and detail that goes into the social marketing I encounter in everyday life.”

**Skills and tools of social marketing.** After completing the certificate program, participants indicated they gained skills and a better grasp of social marketing tools, which they could use in their daily jobs. Sonya stated, “my perceptions of the possibilities of social marketing have certainly been broadened. I had not thought about marketing as a tool for sustainable change before, but I can see that it is a valuable resource.” Jonathan said, “[this approach is something I] was not familiar with before, but after completing this [certificate], not only have I learned a new method of change but also some very important tools I can implement not only in my career but personal life.” At the same time, Smith said, “throughout this program I have gained a better understanding of social marketing and how to implement it within my field.” Ally stated, “the certificate helped me see social marketing as an approachable strategy rather than an opaque buzzword.” Similarly, Corry revealed, “my perception of social marketing has been changed in that I had not previously been aware of how these concepts were applicable beyond the planning and pilot testing stages.”

**Improved understanding of the process.** Before completing the certificate program, participants thought that social marketing was a synonym for social media or it was the sale of commercial products, but after the certificate program, they realized it was different from social media and regular marketing. To that point, Rue stated, “before the course when I would hear social marketing, I associated this term with social media and did not realize how big of a difference there is between the two.” Similarly, Tony said that

> before beginning this program, I thought social marketing was simply a different term for social media. I did not realize it is a process for effecting social change through a variety of mediums, of which social media is only one choice.

The participants also gained an understanding that social marketing relates to selling of ideas not products. In this regard, Sam wrote, “I was surprised to find that social marketing wasn't always about commercial products, but about selling ideas and information to help better individuals and communities.” The certificate program helped participants to understand that social marketing is a unique behavior change methodology.

Participants also discussed in the closing thought activity that they had changed their perceptions toward social marketing. Toly said, “[m]y perception of social marketing has certainly changed positively, it has taught me that one must aim to improve processes which will improve the social behaviors and not the marketer.” In addition, Kayla mentioned:

> [T]o be honest, my perception about social marketing has completely changed. Before this [program] I really had never heard of social marketing and thought social marketing was people sitting in a room thinking about how they could gently tell people to change.

Three additional participants indicated as a result of participation in the certificate program their understanding of social marketing had grown or broadened without providing more specifics.

**Conclusion, Discussion, Recommendation, and Implications**

The high intensity of certificate program participants in *Stage 1 – Informational* at the beginning of the certificate program indicated participants were aware of social marketing and were
keen to learn more about it, but were not immediately ready to use it. The second highest stage of concern (Personal) at the beginning of the certificate program demonstrated participants were concerned with how the use of social marketing would affect them individually. For example, participants were likely concerned with how use of social marketing could affect their professional status or whether they would receive any rewards for applying social marketing to their work. The complete group profile at the beginning of the certificate program (pre-test) revealed that both Stage 1 – Informational and Stage 5 – Collaboration were high, which meant the participants desired to learn what others knew and do rather than make an effort to lead a collaboration.

Many program participants were already beyond Stage 0 – Unconcerned when they began the certificate course. That participants were strongly in the Stage 1 – Informational supports other research suggesting a need for professional development on social marketing (Warner, 2014; Warner et al., 2016) and confirmed we were reaching people who wanted to learn more about this approach to behavior change. This implies that a good number of agricultural education, Extension, and other outreach professionals are actively seeking professional development on how to use social marketing. The low percentile of those in the consequence stage demonstrated overall positive attitudes toward integrating social marketing into the participants’ work.

We interpreted reduction in concerns for initial stages and increase in concerns for later stages after completion of the certificate program as an indication that participants had accepted the usefulness of applying social marketing to their work and had more concerns about collaboration with others in the use of social marketing. In addition, participants were more willing to incorporate social marketing into their current behavior change methodologies.

After comparing the findings from our quantitative and qualitative data, we were able to explain how participants’ concerns and perceptions toward social marketing have changed over the period of certificate program. We were unable to match participants’ stages of concern at the beginning and completion of the certificate program, meaning that our observed changes in stages could be due to dropout of unconcerned participants, which is a limitation of the study. However, our qualitative data suggest that the completing participants did benefit from the program, increasing their positive attitudes toward social marketing, and enhancing their understanding and application of it. As a result of the certificate program, participants appeared to understand that if they systematically use social marketing, they could use it as a tool for promoting changes in behavior.

One of the limitations we consider in our comparison of findings was use of the same participants for collection of our quantitative and qualitative data. In quantitative data collection, the sample should be representative of population from which it was derived (random sample), while in qualitative data collection, the sample should include participants who have experienced the phenomenon under study (Morse, 1991). The transferability after comparing the findings from quantitative and qualitative research methods can be improved by use of a different sample or group of participants (Morse, 1991).

Although the certificate program was not developed for students (i.e., graduate and undergraduate) specifically, we haven’t restricted students from signing up, and to date, quite a few have participated in the program. Students greatly appreciated the certificate and expressed value in the certificate program (data not presented in the study). This exhibited that a certificate program designed to meet the needs of agricultural professionals can serve both the intended audience along with other groups. Therefore, we concluded social marketing has promising applications for outreach professionals from a broad range of fields. Future studies could examine the experiences
of specific audiences of informal educator, nonformal educator, and student audiences in more detail.

We recommend agricultural education professionals use online certificate programs to build the capacity of traditional agricultural education and Extension professionals, but also non-traditional audiences (i.e., graduate students, outreach professionals in other disciplines, and aspiring Extension professionals). That many participants initially confused social marketing with social media is consistent with previous reports that social marketing is widely misunderstood (Warner, 2014). Agricultural education professionals who apply social marketing strategies should consider potential confusion about terminology and ensure stakeholders understand the concepts being used.

Future researchers can match participants’ SoCQ data at the beginning and completion of the certificate program as an evaluation strategy. Using this matched data, researchers can generate individual profiles of the participants to capture a closer look for studying change in concerns for adoption of an innovation. Researchers can also examine the stages of concerns profile by dividing the participants by their roles, such as administrator, staff, or novice Extension agent, and assess whether profiles change due to different roles. Although we used an open-ended closing thoughts response item to collect data for the qualitative section of this study, future researchers could conduct personal interviews or focus groups with participants who completed certificate program to gain deeper insights about their certificate programs.

References


Skills Students Need in the Real World: Competencies Desired by Agricultural and Natural Resources Industry Leaders

R. G. (Tre) Easterly III1, Anna J. Warner2, Brian E. Myers3, Alexa J. Lamm4, & Ricky W. Telg5

Abstract

The competencies addressed by undergraduate agricultural education programs should be assessed so programs are effective in supplying a well-prepared agricultural- and natural resources-oriented workforce, and so human capital is optimized. In this study, agricultural and natural resources leaders were surveyed to determine the workforce competencies they believed graduates of post-secondary agricultural education programs should have obtained. An Internet-based survey was distributed to graduates of an agricultural leadership development (ALT) group and a natural resources leadership development (NRLT) Group. The highest-rated workforce competency categories for the ALT group were being dependable (n = 103), critical thinking (n = 101), strategic planning (n = 98), and clear communication (n = 98); the highest-rated categories for the NRLT group were active listening (n = 73), clear communication (n = 72), and problem solving skills (n = 72). The personal and leadership skills subscales were not significantly different, but natural resources leaders ranked communication competencies as more important than agricultural leaders. Agricultural educators should evaluate the workforce competencies offered in their undergraduate programs and have deliberate conversations about meeting industry needs to better prepare a future workforce.

Key words: Competency, Communication, Leadership, Leaders, Employability, Personal Skills

Author’s Note: This work was supported by the UF/IFAS Center for Public Issues Education.

Introduction

All societies have an obligation to provide young citizens with the required education and skills to become productive and prosperous members of society (Symonds, Schwartz, & Ferguson, 2011). However, in the United States, young adults suffer from a skills gap where they do not have the necessary competencies and work ethic to obtain employment and maintain a middle-class lifestyle. Today’s workforce demands that most members have some form of post-secondary education.
education or training. Thoron, Myers, and Barrick (2016) called for research that explores the ways practitioners can collaborate to deliver education programs as part of the American Association for Agricultural Education National Research Agenda. The AGree report on Food and Agricultural Education the United States also underscored the need for the agricultural education system to supply a workforce prepared to face mounting challenges in agriculture (Mercier, 2015). As the array of issues facing the agriculture community and the content imperative to the solving emerging problems continues to expand, the agricultural education system must broaden and refine itself to address the challenges associated with supplying food globally while sustaining a natural system. Hurst et al. (2015) and Zubovič, Domazet, and Stošić (2009) reinforced these claims and demonstrated their application to a global level. To become more competitive, agricultural and natural resource businesses need to adapt to changes in the global market. The agricultural education system plays a vital role in achieving this goal by supplying a workforce prepared to fit into the current needs of the global system (Hurst et al., 2015; Zubovič et al., 2009).

An average of 57,900 positions will open annually for graduates with a bachelor’s degree or higher in the areas of food, agriculture, renewable natural resources, and the environment (Goecker, Smith, Fernandez, Ali, & Theller, 2015). However, only 61% of these openings are projected to be filled by graduates with degrees in these areas. Approximately 7,000 of those positions will be in the area of education, communication, and governmental services. Agricultural education and communication programs need to prepare students to meet the evolving needs of agricultural employers in order to address the challenges of the 21st century (Andelt, Barrett, & Bosshamer, 1997; Hurst et al., 2015; Maiga, Cartmell, Edwards, & Robinson, 2013; Mercier, 2015; Morgan 2010; Robinson & Garton, 2008; Sargent, Pennington, & Sitton, 2003).

The quality of undergraduate programs must be tied to the abilities of its graduates to be hired within their industry (Andelt et al., 1997). For programs to produce employable graduates, the program and learning environment must be considered purposefully and systematically (Knight & Yorke, 2003). It is vital for university professors who develop program requirements and coursework to remain up-to-date with the current demands of the workforce and integrate feedback from students, researchers, practitioners, and the community (Hurst et al., 2015; Maiga et al., 2013). The literature has recommended agricultural curriculum be evaluated every two to five years to ensure the program is effectively preparing students for the workforce (Andelt, et al. 1997; Morgan, 2010; Morgan, 2012; Morgan & Rucker, 2013). In order to evaluate academic curriculum and ensure it is meeting the relevant needs of the current workforce, researchers must collect data from industry leaders to identify the skills expected from entry-level employees (Maiga et al., 2013; Morgan, 2010; Morgan, 2012). From this feedback, institutes of higher education can make decisions about coursework, competencies, and objectives of undergraduate programs to connect them to relevant industry needs (Andelt et al., 1997; Maiga et al., 2013; Morgan, 2010; Morgan, 2012; Zubovič et al., 2009).

Review of Literature

Businesses expect college graduates to enter the workforce prepared with the skills needed to be successful employees (Knight & Yorke, 2003; Robinson & Garton, 2008; Sargent et al., 2003). Sleezer and Denny (2004) acknowledged the important role human capital, specifically knowledge and innovation capacities, will play in the new economy. They noted the number of highly qualified workers is declining, which will continue to be problematic over the coming years, creating a high demand for college-educated workers if the U.S. wants to continue to develop and apply new technologies. The authors highlighted creating a workforce development infrastructure as one of the four strategies to meet the demand of filling the highly skilled worker deficit, emphasizing the role of educational institutions to “systematically integrated educational resources
with business needs” (Sleezer & Denny, 2004, p. 47). Holzer (2012) also underscored the deficit of middle and highly skilled workers to fill the good-paying positions and suggested education and skills of prospective employees fail to keep pace with employer needs. He noted even graduates with degrees do not possess the sector-required skills to receive good-paying jobs, placing the blame on disconnection between the labor market and the school systems (Holzer, 2012).

University programs need to be sensitive to the needs of employers (Andelt et al., 1997). Although employers want college graduates to come prepared with transferable skills, many graduates have not demonstrated these skills at their jobs, creating a skills gap between employer expectations and employee competencies (Andelt et al., 1997; Symonds et al., 2011). Robinson and Garton (2008) found graduates entering the workforce do not believe they can perform the employability skills at the level required for success in their positions. Similarly, Andelt et al. noted graduates have been unable to obtain employment because during college, they had not developed the knowledge, skills, and competencies required by employers. Employers in the United States complained that young adults are not entering the workforce with the skills necessary to compete in the 21st century (Symonds et al., 2011). The 2015 State of the Industry report completed by the Association for Talent Development reported organizations spent an average of $1,229 per employee learning in 2014, a 1.7% increase from 2013 (Association of Talent Development, 2015). These results confirmed a skills gap exists between employer demands and employee capabilities (Andelt et al., 1997; Robinson & Garton, 2008; Symonds et al., 2011).

Morgan (2010) highlighted the highly dynamic nature of the agricultural communications field today and identified the needs of the field through a Delphi study. Communication-area competencies encompassed a broad variety of communication skills with oral communication identified as most important; listening and writing skills were also essential. In the general education core area, proper use of grammar and writing skills were desired, along with general technology skills and an understanding of business. However, when Morgan and Rucker (2013) identified differences between the skills agricultural communication professors believed were important for undergraduate students to employ upon graduation compared to the competencies which agricultural industry professionals identified as important for entry-level employees, they found while the professors focused on specific, academic skills of communication and thinking, industry professionals desired more general workplace competencies such as ethics and soft skills. Professionals in the field desired graduates with a holistic approach to communications; employers were interested in an employee with the ability to use a variety of communication skills rather than those focused on one area (Morgan, 2010). Since professors play a vital role in the development of their own curriculum, this disconnect between professors’ perceptions of industry needs and the actual needs of the industry can be problematic in preparing employment ready graduates (Morgan & Rucker, 2013). Through curriculum and internship opportunities, academics need to find ways to bridge the gaps that exist so graduates are more prepared to meet the expectations of employers.

Several studies have explored how desired skills are delivered to students. Morgan (2010) found many of the agriculture competencies desired by employees, such as ability to meet deadlines, reliability, dependability, and strong work ethic were taught indirectly through university structure as opposed to being taught through curriculum. Conversely, Sargent et al. (2003) evaluated the success of a 15-week, capstone course designed to develop leadership skills vital in the workplace. Although a major purpose of this course was the development of leadership skills in a work-world setting, the results indicated little growth in leadership skills. In order to better prepare graduates with the leadership skills employers desire, the researchers recommended integration of leadership skills throughout the coursework of a program rather than emphasized through a capstone course in the last semester of coursework. Finally, Hurst et al. (2015) took an extensive look at the components which lead to the development of a productive agricultural...
workforce in the developing country of Trinidad and Tobago, noting the importance of a comprehensive agricultural education system as a major resource in the development of a skilled workforce. The study suggested the development of a program which is effective and efficient at creating a well-trained and competent workforce extends beyond competency and skill development alone. Effective program development should encompass a broader view of the program curricula, facilities, pedagogical approaches, teacher education, agricultural organizations, student/instructor relationships, connections between the schools and communities, globalization of the curricula, and entry into agricultural careers on the development of a trained and efficient agrarian workforce. The researchers recommended more interaction and communication between educational institutions, improved outreach programs, and integration of co-curricular student organizations.

Research has also investigated what skills alumni in the college of agriculture at the University of Missouri (Robinson & Garton, 2008) and agricultural communication programs (Morgan, 2012) believed were important for graduates to have when entering entry-level positions upon graduation. The top five employability skills identified by Robinson and Garton (2008) were solving problems, ability to work independently, functioning well in stressful situations, maintaining a positive attitude, and listening attentively. These skills encompassed general workplace skills which Morgan (2010) found employers desiring. Skills which emerged from focus groups with agricultural communications alumni included writing and basic communication skills, contextual agricultural knowledge, the ability to find a story, public speaking, and general employability skills, as found by Morgan (2010) and Robinson and Garton (2008). Agricultural communications graduates also emphasized the critical role internships played in their preparation for the workplace during their undergraduate program (Morgan, 2012).

**Theoretical Framework**

The theoretical framework for this study was Human Capital Theory. Zubović et al. (2009) defined human capital as the “accumulated knowledge, created in the long term process of human resources development, which begins in early stages and lasts all through the life” (p. 1). Human capital encompasses knowledge, skills, and experiences of individuals within an organization “expressed as a function of education and a measure of economic activity” (Kaufman & Geroy, 2007, p. 37). Governments view an investment in human capital as a means to improved economic efficiency and success (Hurst et al., 2015; Maiga et al., 2013).

Since human capital is more valuable than resources such as land, labor, and other capital, it is vital to help individuals develop skills specific to their sector (Maiga et al., 2013; Zubović et al., 2009). Strong program development for agricultural education and communication programs can lead to improvements in the relationships between researchers and the general public through informing, educating, and entertaining. Additionally, the development of human capital among the agrarian population has the potential to increase productivity. Governments, employers, and other stakeholders have expected higher-education institutions to increase human capital by developing a collection of vital skills employees can use to maximize productivity (Knight & Yorke, 2003). Human capital can be developed through “formal/mainstream education, non-formal/extension education, in-service training, and mass-media” (Hurst et al., 2015, p. 143). An investment in higher education should increase human capital, thus enhancing the workforce for economic success (Hurst et al., 2015; Knight & Yorke, 2003).

Since human capital is developed through education and is valued by employers, research should consistently re-evaluate the needs of industry to inform educational institutions so the institutions can overcome the skills gap and prepare the most valuable graduates (Andelt, et al.,
Agricultural education programs have limited time and credit hours in which to develop the skills of students and prepare them to enter the workforce (Swortzel, 1999). In order to utilize this time most efficiently, programs should identify which skills are most relevant and vital in meeting the current need of the industry. Once industry-desired competencies have been identified, agricultural education departments should design their curriculum to develop those competencies in their students. Students who develop the industry-required skills should enter the workforce as more productive employees prepared to address the challenges of the 21st century (Andelt, Barrett, & Bosshamer, 1997; Hurst et al., 2015; Maiga, Cartmell, Edwards, & Robinson, 2013; Mercier, 2015; Morgan 2010; Robinson & Garton, 2008; Sargent, Pennington, & Sitton, 2003).

**Purpose and Objectives**

The purpose of this study was to determine key workforce competencies desired by agricultural and natural resources leaders. The findings will inform the design of courses in agricultural education departments. This study was guided by the following objectives.

1. Determine the personal, communication, and leadership skills desired by agricultural leaders.
2. Determine the personal, communication, and leadership skills desired by natural resources leaders.
3. Compare the personal, communication, and leadership skills desired by agricultural and natural resources leaders.

**Methods**

A descriptive survey method was employed to assess the competencies desired by agricultural and natural resources leaders (Ary, Jacobs, Sorensen, & Walker, 2014). The population of the study was participants in agricultural and natural resource leadership programs. The agricultural professional population was represented by a census of alumni from an Agriculture Leadership Training Group (ALT) (pseudonym). The ALT is a 22-month program providing leadership training to professionals in agricultural industries. The natural resources leaders were represented by a census of graduates from the Natural Resources Leadership Training Group (NRLT) (pseudonym). NRLT is an eight-month professional development program designed to provide leadership and conflict management training to create a network of leaders prepared to address natural resources issues. These groups were selected to represent those who employ graduates with agricultural communication and leadership degrees.

Data were collected using two identical instruments that were delivered at two separate times. Data were collected between July 1, 2015, to July 21, 2015, for the ALT group and from August 12, 2015, to August 28, 2015, for the NRLT group. Alumni of the programs were used to collect data. The survey was sent to the alumni of nine ALT classes, which consisted of 236 members. Sixteen emails were undeliverable, changing the frame to 220. A response rate of 50% was obtained. Five responses were removed because they did not fully complete the instrument, resulting in 105 usable responses. The instrument was also sent to 235 NRLT alumni. Twelve emails were undeliverable, changing the frame to 223. Responses were received from 77 respondents resulting in a response rate of 34.5%. An Internet-only survey using the Qualtrics program was used for both instruments for this study.
According to Dillman, Smyth, and Christian (2014), one of the major sources of error in survey research is non-response error. Linder, Murphy, and Briers (2001) indicate early and late respondents can be compared using a Pearson $X^2$ to address non-response error. In this study early respondents were those participants who responded to either the initial response or the first reminder. Late respondents were those who responded more than two days after the first reminder. The early and late respondents were compared separately for the two groups. There were no significant differences in the primary variables of interests between the early and late respondents of either group. According to Radhakrishna and Doamkekpor (2008), the results of a census can be generalizable if early and late respondents are found to be similar.

**Survey Instrument**

The survey instrument was administered as two separate instruments to the two groups. Both instruments were identical but were administered at different times. This study was part of a larger survey instrument, which had been pilot-tested on graduate students in the agricultural and natural resources field. The instrument used for this study consisted of three parts plus demographic questions. The first portion of the instrument sought to determine personal skills required by employees in the agricultural and natural resources industries. The skills in the instrument were developed by direct interviews with a group of agricultural and natural resources industry leaders. During the interviews, the leaders were asked questions about what skills and competency areas were important for them when hiring employees. Eleven personal skills emerged from the directed interviews. The skills were reviewed by a panel of experts consisting of three faculty members involved in teaching, research, and extension related to agricultural communications and leadership who found the instrument to be valid. Cronbach’s alpha was calculated to determine if the instrument was a reliable measure of personal skills. The Cronbach’s alpha was .90, which exceeds the minimum acceptable level for cognitive measures recommended by Nunnally (1978).

The leadership and communication skills were developed by faculty members at the University of Florida to represent competencies currently offered to students. The questions were reviewed by a panel of experts consisting of the director of the Center for Public Issues Education in Agriculture and Natural Resources, the associate director of the Center for Public Issues Education in Agriculture and Natural Resources, an associate professor specializing in communication and leadership education, and the director of ALT. To ensure internal reliability, Cronbach’s alpha was calculated on the two constructs *ex post facto*. The Cronbach’s alpha was .89 for the leadership skills and .87 for the communication skills, which were in the acceptable range, according to Nunnally (1978).

**Data Analysis**

The data were imported from Qualtrics into the Statistical Package for the Social Sciences (SPSS) version 22. Frequencies were calculated for each individual group. One-way ANOVAs were calculated to determine mean differences between the subscales for each group. An alpha level of .05 was established as significant *a priori*.

**Results**

Of the ALT participants, 47.6% (n = 50) of the respondents indicated their highest level of education completed was a four-year college degree, 34.5% (n = 36) indicated their highest level of education was a graduate or professional degree, and 17.3% (n = 18) indicated they were high school graduates. Ninety-four percent (n = 99) of the ALT respondents indicated they were white. Of the 105 respondents from the ALT, 66.7% (n = 70) were male and 32.4% (n = 34) were female.
One participant did not indicate their sex. Of the 77 NRLT participants, 46.8% (n = 36) were male and 50.6% (n = 39) were female. Two participants did not indicate their sex. The level of education reported by the NRLT participants was 70.1% (n = 54) earned a graduate or professional degree, 20.8% (n = 16) had a four-year college degree, and 6.5% (n = 5) had some college or a two-year degree. Ninety-four percent (n = 72) of the NRLT respondents indicated they were white.

**Research Objective One**

Researchers sought to determine the personal, communication, and leadership skills desired by agricultural leaders. Agricultural leaders were participants from ALT. All of the personal traits had more than half of the respondents indicate they were *very important* or *extremely important* (See Table 1.). The personal skills with the highest frequency of *very important* or *extremely important* responses were being dependable (n = 103), problem solving (n = 97), and taking initiative (n = 97). The personal skills with the highest frequency of *not important* or *somewhat important* were positivity (n = 7), being organized (n = 4), and flexibility (n = 4).

All of the ratings for the importance of leadership traits for the ALT graduates had more than half of the responses as *very important* or *extremely important*, save for the competency showing empathy, which 15 respondents indicated it was *not important* or *somewhat important*. The leadership traits with the highest importance rank were critical thinking (n = 101), strategic planning (n = 98), and clear communication (n = 98). The leadership skill assertiveness had the second-lowest frequency of respondents indicated it was *very important* or *extremely important* (n = 57), and had six respondents indicate it was either *not important* or *somewhat important* (See Table 2).
### Table 1

*Importance of Personal Skills According to ALT (n = 105) and NRLT (n = 77) Graduates*

<table>
<thead>
<tr>
<th>Personal Skills</th>
<th>Not Important or Somewhat Important</th>
<th>Important</th>
<th>Very Important or Extremely Important</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>f</td>
<td>%</td>
</tr>
<tr>
<td>Being Dependable</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ALT</td>
<td>105</td>
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</tr>
<tr>
<td>NRLT</td>
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<td>2.6</td>
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</tr>
<tr>
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</tr>
<tr>
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<tr>
<td>ALT</td>
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<td>0.0</td>
</tr>
<tr>
<td>NRLT</td>
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<td>0.0</td>
</tr>
<tr>
<td>Being Receptive to Changes</td>
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</tr>
<tr>
<td>NRLT</td>
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<td>0.0</td>
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<tr>
<td>Being Innovative</td>
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</tr>
<tr>
<td>ALT</td>
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<td>1</td>
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</tr>
<tr>
<td>NRLT</td>
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<td>0.0</td>
</tr>
<tr>
<td>Flexibility</td>
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<tr>
<td>ALT</td>
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<tr>
<td>NRLT</td>
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<tr>
<td>Being Focused</td>
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<tr>
<td>ALT</td>
<td>105</td>
<td>3</td>
<td>2.9</td>
</tr>
<tr>
<td>NRLT</td>
<td>77</td>
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<td>1.3</td>
</tr>
<tr>
<td>Being Open to Feedback</td>
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<tr>
<td>ALT</td>
<td>105</td>
<td>2</td>
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<tr>
<td>NRLT</td>
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<tr>
<td>NRLT</td>
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<td>3.9</td>
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<td>ALT</td>
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<td>NRLT</td>
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</tr>
<tr>
<td>NRLT</td>
<td>77</td>
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<td>1.3</td>
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</table>
Table 2

Importance of Leadership Skill According to ALT (n = 105) and NRLT (n = 77) Graduates

<table>
<thead>
<tr>
<th>Skill</th>
<th>ALT</th>
<th></th>
<th></th>
<th>NRLT</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>f</td>
<td>%</td>
<td>n</td>
<td>f</td>
<td>%</td>
</tr>
<tr>
<td>Critical Thinking</td>
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<tr>
<td>ALT</td>
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<td>0.0</td>
<td>4</td>
<td>3.8</td>
<td>96.2</td>
</tr>
<tr>
<td>NRLT</td>
<td>77</td>
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<td>0.0</td>
<td>6</td>
<td>7.8</td>
<td>92.2</td>
</tr>
<tr>
<td>Clear Communication</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>ALT</td>
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<td>7</td>
<td>6.7</td>
<td>93.3</td>
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<tr>
<td>NRLT</td>
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<td>5</td>
<td>6.5</td>
<td>93.5</td>
</tr>
<tr>
<td>Strategic Planning</td>
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<td></td>
</tr>
<tr>
<td>ALT</td>
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<td>1.0</td>
<td>6</td>
<td>5.7</td>
<td>93.3</td>
</tr>
<tr>
<td>NRLT</td>
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<td>0.0</td>
<td>6</td>
<td>7.8</td>
<td>92.2</td>
</tr>
<tr>
<td>Self-Motivation</td>
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<tr>
<td>ALT</td>
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<td>1.0</td>
<td>8</td>
<td>7.6</td>
<td>91.4</td>
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<td>2.6</td>
<td>7</td>
<td>9.1</td>
<td>88.3</td>
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<tr>
<td>Decision Making</td>
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<tr>
<td>ALT</td>
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<td>0.0</td>
<td>9</td>
<td>8.6</td>
<td>91.4</td>
</tr>
<tr>
<td>NRLT</td>
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<td>2.6</td>
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<td>89.6</td>
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<td>11</td>
<td>10.6</td>
<td>88.5</td>
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<tr>
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<td>4</td>
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<td>Team Work</td>
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<tr>
<td>ALT</td>
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<td>14</td>
<td>13.3</td>
<td>86.7</td>
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<tr>
<td>NRLT</td>
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<td>0.0</td>
<td>6</td>
<td>7.8</td>
<td>92.2</td>
</tr>
<tr>
<td>Confidence</td>
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<td></td>
</tr>
<tr>
<td>ALT</td>
<td>105</td>
<td>1</td>
<td>1.0</td>
<td>21</td>
<td>20.0</td>
<td>79.0</td>
</tr>
<tr>
<td>NRLT</td>
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<td>2.6</td>
<td>16</td>
<td>21.1</td>
<td>76.3</td>
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<tr>
<td>Assertiveness</td>
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<tr>
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<td>40.0</td>
<td>54.3</td>
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<tr>
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<td>5.2</td>
<td>27</td>
<td>35.1</td>
<td>69.7</td>
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<tr>
<td>Showing Empathy</td>
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<tr>
<td>ALT</td>
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<td>15</td>
<td>14.3</td>
<td>42</td>
<td>40.0</td>
<td>54.3</td>
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<tr>
<td>NRLT</td>
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<td>5</td>
<td>6.5</td>
<td>17</td>
<td>22.1</td>
<td>71.4</td>
</tr>
</tbody>
</table>
Three communications skills reported by the ALT graduates had more than half of the responses as either very important or extremely important (See Table 3). Those skills were dealing with crisis \( (n = 89) \), public speaking \( (n = 88) \), and strong writing skills \( (n = 74) \). The following communications skills had more respondents rank the competency as not important or somewhat important compared to very important or extremely important: graphic design \( (n = 51) \), photography \( (n = 43) \), videography \( (n = 41) \), website design \( (n = 37) \), and event planning \( (n = 33) \).

Table 3

Importance of Communications Skills According to ALT \((n = 105)\) and NRLT \((n = 77)\) Graduates

<table>
<thead>
<tr>
<th>Skill</th>
<th>Not Important or Somewhat Important</th>
<th>Important</th>
<th>Very Important or Extremely Important</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>( n )  ( f ) ( % )</td>
<td>( f ) ( % )</td>
<td>( f ) ( % )</td>
</tr>
<tr>
<td>Dealing with Crisis</td>
<td>ALT 105 6 5.7 10 9.5 89 84.8</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>NRLT 76 3 3.9 12 15.8 61 80.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Public Speaking</td>
<td>ALT 105 7 6.7 10 9.5 88 83.8</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>NRLT 77 1 1.3 11 14.3 65 84.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Strong Writing Skills</td>
<td>ALT 105 9 8.6 22 21.0 74 70.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>NRLT 76 1 1.3 9 11.8 66 86.8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social Media</td>
<td>ALT 105 22 21.0 38 36.2 45 42.9</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>NRLT 77 13 16.9 24 31.2 40 51.9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Website Design</td>
<td>ALT 105 37 35.2 35 33.3 33 31.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>NRLT 77 23 29.9 26 33.8 28 36.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Videography</td>
<td>ALT 105 41 39.0 32 30.5 32 30.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>NRLT 77 24 31.2 31 40.3 22 28.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Photography</td>
<td>ALT 104 43 41.3 35 33.7 26 25.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>NRLT 77 17 22.1 39 50.6 21 27.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Event Planning</td>
<td>ALT 105 33 31.4 46 43.8 26 24.8</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>NRLT 77 12 15.6 26 33.8 39 50.6</td>
<td></td>
<td></td>
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<tr>
<td>Graphic Design</td>
<td>ALT 105 51 48.6 38 36.2 16 15.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>NRLT 77 28 36.4 28 36.4 21 27.3</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Research Objective Two

Researchers wanted to determine the personal, communication, and leadership skills desired by natural resources leaders represented by NRLT graduates. The personal skills are represented in Table 1. The personal skills with the highest frequency of very important or extremely important responses were problem solving skills (n = 72), being dependable (n = 70), taking initiative (n = 70), and being receptive to changes (n = 70). All of the personal skills had more than half of the responses as very important or extremely important.

The majority of respondents indicated the leadership skills were either very important or extremely important. The most important leadership competencies according the NRLT graduates were active listening (n = 73), clear communication (n = 72), strategic planning (n = 71), critical thinking (n = 71), and team work (n = 71) (See Table 2). The communication skills that more than half of the respondents indicated were very important or extremely important were strong writing skills (n = 66), public speaking (n = 65), dealing with a crisis (n = 61), social media (n = 40), and event planning (n = 39). The communication skills with the highest number of responses in either not important or somewhat important were graphic design (n = 28), videography (n = 24), website design (n = 23), and photography (n = 17) (See Table 3.).

Research Objective Three

Finally, researchers wanted to compare the personal, communication, and leadership skills desired by agriculture and natural resources leaders. Mean scores from each overall scale were calculated. The grand means for each group and the mean difference is displayed in Table 4. Skewness and kurtosis were measured to assure the assumption of normality was not violated. The measures were found to be within the acceptable level as determined by Ferguson and Cox (1993). The mean difference for the personal skills and leadership were not significant. The difference between the group means for communication was significant ($F(1, 180) = 5.40, p = .02$).

Table 4

Mean Differences between NRLT and ALT Groups

<table>
<thead>
<tr>
<th></th>
<th>ALT</th>
<th>NRTL</th>
<th>Mean Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n  M (SD)</td>
<td>n  M (SD)</td>
<td></td>
</tr>
<tr>
<td>Personal</td>
<td>102 4.24 (0.54)</td>
<td>77 4.28 (0.52)</td>
<td>0.04</td>
</tr>
<tr>
<td>Leadership</td>
<td>104 4.25 (0.50)</td>
<td>76 4.29 (0.55)</td>
<td>0.04</td>
</tr>
<tr>
<td>Communication</td>
<td>104 3.29 (0.66)</td>
<td>75 3.53 (0.67)</td>
<td>0.24*</td>
</tr>
</tbody>
</table>

Note. *$p < .05$

Conclusions and Implications

These findings indicated personal and leadership competencies are important to both agricultural and natural resources leaders. Several competencies in these areas had a high level of importance. The highest level of agreement for personal competencies for both groups were (a) being dependable, (b) problem solving, and (c) taking initiative. The highest level of agreement for leadership competencies for both groups were (a) critical thinking, (b) clear communication, and (c) strategic planning. These skills mirror those skills Robinson and Garton (2008) and Morgan (2010) found to be important in the industry. The mean differences were not significantly different,
which indicates there is not a difference in the personal and leadership competencies desired by the agricultural leaders and natural resources leaders for the personal and leadership competencies subscales.

The communication competencies with the highest level of importance for both groups were (a) dealing with crisis, (b) public speaking, and (c) strong writing skills. The lowest level of importance for the groups were (a) graphic design, (b) photography, and (c) videography. Although these rank as the lowest level of importance, it is important to note some of them still had a majority of leaders ranking them as extremely or very important. The participants of this study did not value these technical communication and design skills to as high of a degree as the personal and leadership skills. While these skills may be important, the critical thinking and teamwork skills may be more important for these programs. These findings are similar to the findings of Morgan (2010), who reported industry leaders valued soft skills and a holistic approach to communication rather than finite competencies related to specific communication modes.

A comparison of the mean scores between the personal and leadership competencies subscales indicated both groups valued these competencies equally. The mean scores for the communication competencies showed agricultural leaders tend to value these competencies less than natural resources leaders. While the difference was statistically significant, the difference of 0.24 on a five-point scale raises the question of practical significance. Bearing that caveat, these findings indicate a possible difference in the communication skills required for graduates pursuing employment in agricultural fields, compared to those pursuing employment in the natural resources field.

The findings of this study call for a review of the competencies taught in agricultural education, communication, and leadership degree programs. These findings are congruent with Morgan (2010), Morgan (2012), and Morgan and Rucker (2013). The high level of importance of the personal and leadership skills highlights the need for developing those skills, which is supported by the findings of Sargent et al. (2003) who recommended incorporating leadership training throughout the entire curriculum. If the success of undergraduate programs is measured on their ability to be hired, as recommended by Andelt, et al. (1997), then the programmatic offering of these programs should be adjusted to focus on developing personal and leadership competencies desired by professionals in the field. Caution should be used when implementing the findings of this study, since the population was exposed to advance training, which could influence their response.

According to Hurst et al. (2015) and Knight and Yorke (2003), investing in higher education is an important way to increase human capital. The findings in this study illuminate where that investment should take place. Agricultural and natural resources leaders value individuals who can think critically and communicate clearly in all situations, including during a crisis or when solving a problem.

Recommendations

Building upon the theoretical framework of human capital, these findings undergird the need to re-evaluate current curriculum to better meet the needs of industry professionals. This study provides an ordered list of the competencies desired by industry professionals. Further studies should be conducted to determine the ideal configuration of courses and instruction within courses to help students meet these competencies. The data show some competencies taught in the programs are not viewed as crucial by agricultural and natural resources leaders. Additionally, Morgan (2012) recommended implementing feedback from alumni to improve programs.
Hurst et al. (2015) underscored the importance of performing a multi-faceted evaluation of programmatic offerings to optimize human capital investments in the ideal blend of competencies, technical skills, and pedagogical approach. Further investigation should be conducted to determine the ideal coursework arrangement to teach students these competencies. Research is also needed to determine the most effective pedagogical practices for developing these abilities. The data in this study highlighted the importance of crisis communication, strong writing skills, and public speaking skills. Based on these findings, we recommend programs develop problem-based instruction that includes real-life crisis management scenarios to teach communication skills, while developing personal and leadership skills. Further research is needed to test the efficacy of this method of teaching.

Furthermore, we recommend programs increase the opportunities for students to practice public speaking and writing skills in real-world application. Perhaps courses could be designed to integrate technical agricultural content with writing, public speaking, and problem solving skills in a transdisciplinary setting. Development of these courses will take collaboration from individuals outside the agricultural education department, including industry leaders and faculty teaching in technical agriculture and/or natural resources disciplines. Promoting involvement in student organizations may also provide more opportunities for students to develop the required leadership skills in a real-world setting. Building on the recommendations of other researchers, we also recommend programs integrate industry professionals’ feedback as a priority when university professors create program requirements and coursework, in order to design programs which reflect the needs of the industry (Andelt et al., 1997; Holzer, 2012; Morgan, 2010; Sleezer & Denny, 2004). For example, creating an advisory board that looks over program changes and provides insight on the most current issues facing the agriculture and natural resources industries would ensure the program is timely and relevant. Those involved in programmatic decisions for agricultural education programs should remain engaged in a deliberate conversation with industry representatives about what competencies should be taught in their programs and how they should best be delivered. These conversations should specifically address how to develop skills, such as dependability and taking initiative, which are difficult to directly teach in a classroom.

References


Describing Parents’ Perceptions, Valuation, and Support of Study Abroad Programs at Three Southern Land-Grant Universities

Tobin Redwine1, Joey Blackburn2, J.C. Bunch3, Laura Greenhaw4, Tracy Rutherford5, Gary Wingenbach6 & David Walther7

Abstract

Parents are an integral part of the decision to study abroad, but little research investigates parents’ perceptions about study abroad. This study uses the Theory of Planned Behavior as a conceptual framework to explain perceptions and value of study abroad by parents of agriculture students at Land-Grant universities based on previous international experiences and other beliefs. Researchers delivered a questionnaire to 1511 parents at three universities to measure perceptions and value of study abroad, and intent to support their students’ participation in study abroad. We found that parents had little international experience, which may limit their behavioral beliefs and impact their decision to support study abroad. We also found that parents believed short-term, summer programs, that cost between $2000 and $4000 were ideal. Finally, we found that parents believed that study abroad programs were somewhat important and that they were somewhat likely to support their students’ participation. Administrators and faculty should consider parent expectations and value when planning study abroad, and work to provide education and outreach to enhance value beliefs and normative beliefs of parents. Further research should explore the predictive value of previous experiences in parents’ likelihood to support a students’ decision to study abroad.

Keywords: International Experiences, Study Abroad, College of Agriculture; Parent Perceptions

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Introduction and Literature Review

“Travel is educational” (Stone & Petrick, 2013, p. 741). This statement has been verified for a variety of situations, ranging from independent travel (Inkson & Myers, 2003; Kuh, 1995) to formal international experiences such as study abroad programs (Parsons, 2010). Specifically, study abroad programs have been referred to as “one of the most important experiences students can have during their undergraduate years” (Paige, Fry, Stallman, Josić, & Jon, 2009, p. S41). Further, global learning and international experiences have been identified as important components of higher education by the American Association of Colleges and Universities (Hovland, 2009), the American Association for Agricultural Education (Roberts, Harder, & Brashears, 2016), and the Association of Public and Land-grant Universities (2010).

Researchers in higher education have sought to determine the benefits of study abroad. The benefits identified include: (a) greater global awareness and mindset (Ingraham & Peterson, 2004; Paige et al., 2009; Parsons, 2010; Rexeisen, Anderson, Lawton, & Hubbard, 2008; Ricketts & Morgan, 2009; Zhai & Scheer, 2002), (b) increased cultural awareness and higher acceptance of cultural diversity (Childress, 2009; Dwyer, 2004; Freestone & Geldens, 2008; Parsons, 2010; Zhai & Scheer, 2002), (c) increased levels of confidence and self-efficacy (Bachner & Zeutschel, 2009; Chieffo, 2007; Zhai & Scheer, 2002), (d) increased preparation for domestic and international careers (Childress, 2009; Ludwig, 2007), and (e) increased communication skills (Ludwig, 2007; Parsons, 2010).

Agricultural educators have pursued multiple lines of inquiry regarding international education. Previous studies have focused on determining agricultural students’ perceptions, motivations, and barriers to study abroad participation (Briers, Shinn, & Nguyen, 2010; Bunch, Blackburn, Danjean, Stair, & Blanchard, 2015; Bunch, Lamm, Israel, & Edwards, 2013; Danjean, Bunch, & Blackburn, 2015; Irani, Place, & Friedel, 2006), agricultural faculty beliefs about international education experience (Harder, Lamm, Roberts, Navarro, & Ricketts, 2012), and experiential learning styles of agricultural students in an international experience (Lamm et al., 2011). Additionally, Zhai and Scheer (2002) documented the influence of study abroad programs on agriculture students’ global perspectives and cultural diversity attitudes, among other outcomes. Agriculture students in a study abroad program were also shown to have enhanced perspectives on culture, communication, adaptation, and knowledge value (Black, Moore, Wingenbach, & Rutherford, 2013). Sharp and Roberts (2013) noted that agricultural faculty participation in study abroad programs stimulated development of curriculum. Even high school agricultural educators have benefitted from study abroad programs (Foster, Rice, Foster, & Barrick, 2014). However, questions remain about specific factors that influence undergraduate agriculture students’ decision of whether or not to participate in international education opportunities.

The increased emphasis on international experiences has produced growth of international opportunities within the higher education system in the United States (U.S.) (Paige et al., 2009). The number of U.S. students who studied abroad has more than tripled in the past 20 years, reaching a high of 304,467 students in the 2013–2014 academic year (Institute of International Education (IIE), 2014; 2015). Similarly, the number of U.S. agriculture students who studied abroad has increased, with more than 5,700 students studying abroad during the 2013–2014 academic year. However, this represents less than two percent of the total number of students who studied abroad (IIE, 2015).

Parents have been identified as influential in the decision making process of college students (Moogan, Baron, & Harris, 1999; Welki & Navratil, 1987). Further, parents and family have been found to be the primary source of funding for U.S. students’ participation in study abroad
programs (Institute of International Education, 2014). However, few studies (none in the US) have explored parents’ perceptions of study abroad, specifically. Of the identified research, very specific populations have been examined (none in the US). Bodycott (2009) surveyed 451 Chinese parents and 100 Chinese students and found differences between parents’ and students’ beliefs when considering studying abroad. Bodycott (2009) also noted the significance of cultural influence in the study. Al-Makhmari and Amzat (2012) interviewed parents of female students in Oman and found disconnect between what parents valued in study abroad programs and what students valued. These studies provide further evidence of the need for greater understanding of U.S. parents’ perceptions of study abroad programs.

**Conceptual Framework**

This study employed Ajzen’s (1991) theory of planned behavior (TPB) as a conceptual framework. The crux of the theory revolves around the concept of belief salience, which is the “relation between a person’s salient beliefs about the behavior and his or her attitude toward that behavior” (Ajzen, 1991, p. 192). The theory posits that behavioral beliefs, normative beliefs, and control beliefs guide human behavior by influencing intention to perform the given behavior (see Figure 1). Behavioral beliefs influence whether individuals have either a favorable or unfavorable attitude toward a given behavior (Ajzen, 1991). Further, normative beliefs impact subjective norm, which is “perceived social pressure to perform or not perform the behavior” (Ajzen, 1991, p. 188). Finally, control beliefs affect the individual’s perceived behavioral control, which are often operationalized in research as benefits and barriers to behavior performance (Ajzen, 1991). Per the theory, manipulation of one or more beliefs can elicit increased chances of behavior modification (Ajzen, 2006).

![Figure 1. The Theory of Planned Behavior. Adapted from “The Theory of Planned Behavior,” by I. Ajzen, 1991, Organizational Behavior and Human Decision Processes, 50(2), p. 182. Copyright 2006 by Icek Ajzen.](image)

Specifically related to this study, the behavior in question was parents’ decision to support their students’ participation in study abroad programs (see Figure 2). Parents’ intention to perform the behavior is influenced by their behavioral beliefs, as well as their control beliefs. The present study is concerned with the area of normative beliefs. An individual’s perception of social norms and societal reactions to a planned behavior constitute their normative beliefs (Ajzen, 2006).
other words, parents’ intention to study abroad is influenced by a variety of factors (Ajzen, 1991, p. 195). Therefore, it is important to investigate parents’ beliefs and perceptions of normal programmatic functions and features of study abroad. Parents and family structure are considered part of the students’ normative belief structure, highlighting the connection between parents and students in the study abroad program decision-making process.

**Figure 2.** Conceptualized factors that could affect agriculture students’ decision to study abroad.

As such, behavioral beliefs, normative beliefs, and control beliefs are all integral parts to understanding planned behavior (Ajzen, 2006). Investigation into parents’ perceptions and values related to international experiences, such as study abroad, should provide decision makers in colleges of agriculture with additional information and insight as to how to increase agriculture student participation. As such, the principle question that arose from the review of the literature was: How do parents of incoming undergraduate agriculture students perceive study abroad programs?

**Purpose and objectives**

The purpose of this descriptive study was to determine incoming (operationally defined as first-time enrollees) undergraduate agriculture students’ parents’ perception, valuation, and intention to support study abroad programs at three southern U.S. land-grant institutions. The following research objectives guided this study:

1. Determine prior international experiences of undergraduate agriculture students’ parents and their households
2. Determine parents’ perceptions of study abroad at each institution
3. Determine parents’ valuation (i.e., perceived importance and intention to support) of study abroad at each institution
Methodology

Population and Sample

The target population of this study was parents of undergraduate agriculture students who were enrolling for the first time in a college of agriculture at three selected southern land-grant institutions (N = 1511). Questionnaires were collected from 868 participants (University A, n = 508; University B, n = 258; and University C, n = 102) yielding a response rate of 57.5%. Instruments were distributed to consenting participants at their student’s orientation conference, one of the few times when many parents accompany their student to university functions. Only one parent per household was asked to complete the instrument.

University A. Of the 508 parents who completed the instrument at University A, the majority (n = 363; 71.5%) were female and most (n = 414; 81.5%) were married. Regarding level of education, over 44% (n = 225) of the parents held a bachelor’s degree, followed by some college (n = 86; 16.9%), master’s degree (n = 69; 13.6%), high school diploma/GED (n = 44; 8.7%), associate’s degree (n = 28; 5.5%), professional school degree (n = 17; 3.3%), no high school diploma (n = 16; 3.3%), and doctoral degree (n = 11; 2.2%). Nearly three-fourths (n = 376; 74%) of the parents indicated they were not multilingual, while 117 (23%) indicated they were multilingual. Nearly 70% of the parents indicated their total household income was greater than $74,000 per year. The next most frequent choice (n = 40; 7.9%) of annual household income was $59,000 – 73,999.

University B. In all, 258 parents completed the instrument at University B. The majority (n = 204; 79.1%) were female and most (n = 201; 77.9%) were married. Regarding level of education, 40.3% (n = 104) of the parents held a bachelor’s degree, followed by master’s degree (n = 57; 22.1%), some college (n = 30; 11.6%), associate’s degree (n = 30; 11.6%), high school diploma/GED (n = 15; 5.8%), and professional school degree (n = 10; 3.9%). Two (0.8%) did not have a high school diploma and five (1.9%) did not respond. The majority (n = 231; 89.5%) of the parents indicated they were not multilingual, while 19 (7.4%) indicated they were multilingual. The majority of the parents (n = 170; 65.9%) indicated their total household income was greater than $74,000 per year. The next most frequent choice (n = 26; 10.1%) of annual household income was $59,000–73,999.

University C. A total of 102 parents completed the instrument at University C. The majority (n = 77; 75.5%) were female and most (n = 82; 80.4%) were married. Regarding level of education, 37.3% (n = 38) of the parents held a bachelor’s degree, followed by master’s degree (n = 20; 19.6%), some college (n = 16; 15.7%), associate’s degree (n = 12; 11.8%), high school diploma/GED (n = 9; 8.8%), and professional school degree (n = 5; 4.9%). Two (2.0%) did not respond to the level of education item. The majority (n = 89; 87.3%) of the parents indicated they were not multilingual, while 12 (11.8%) indicated they were multilingual. The majority of the parents (n = 72; 70.0%) indicated their total household income was greater than $74,000 per year. The next most frequent choice (n = 10; 9.8%) of annual household income was $59,000–73,999.

Research Design

This study followed Fraenkel and Wallen’s (2009) steps to survey research, including identifying the problem, identifying the target population, and preparing the instrument. This study utilized face-to-face completion of questionnaires to enhance data collection and maximize response rate. Four main threats to internal validity are common in survey research (Fraenkel and Wallen, 2009): mortality, location, instrumentation, and instrument decay. Mortality was controlled
in this study by limiting data collection to one questionnaire, completed in one setting. Location as a threat to internal validity was controlled by utilizing anonymous responses, so participants would feel minimal pressure to answer questions about a study abroad program, despite being on university campuses. Instrument decay was minimized by designing a questionnaire that took less than 30 minutes for participants to complete. However, one limitation to attempt to control location as a threat to internal validity may exist, as questionnaires were collected on three different university campuses, making it difficult to replicate the environment in all responses.

Instrumentation

A researcher-designed instrument was used to collect data. Researchers followed Ajzen’s (2013) guide to constructing a questionnaire based on the theory of planned behavior. Ajzen (2013) recommends that items be specifically written to align with attitude, perceived norms, perceived behavioral control, and intention. As such, items that measured attitude included questions like “How important is participating in a study abroad program to your student’s academic experience?” Items that measured perceived norms included questions like, “What is the appropriate length of time for a study abroad program?” and “At which academic level is it most suitable for your student to participate in a study abroad?” Items employed to measure perceived behavioral control include questions like, “What is the most appropriate amount to spend on a study abroad program?” Items utilized to measure intention include questions like, “How likely are you to support your student’s participation in a study abroad program?” Cronbach’s alpha was not calculated, as there were no summed scales and there were only two likert-type questions.

A panel of subject matter experts reviewed the instrument; including four faculty members and two graduate students, for content and face validity. The panel recommended minimal changes to increase clarity and readability, as such, all recommended changes were incorporated prior to administration. Due to nature of the data collected, Cronbach’s alpha was not calculated. Data associated with research objectives one, two, and three were analyzed via descriptive statistics, specifically frequencies and percentages. Means and standard deviations were employed to analyze data associated with research objective four.

Findings

Research Objective 1: Determine Prior International Experiences of Undergraduate Agriculture Students’ Parents and their Households

Objective one sought to determine prior international experiences of participants and their households. Participants were asked to mark all experiences from a list they or anyone in their household had experienced (see Table 1). The four most commonly reported responses were the same at each institution: (a) eating at an international restaurant, (b) listening to an international speaker in a school or workplace setting (c) listening to an international speaker in a religious setting, and (d) an international festival or arts. The two least commonly reported responses were the same at each institution (a) participating in a semester-long study abroad, and (b) participating in a short-term study abroad.
Table 1

*Previous International Experiences had by members of Participants’ Households*

<table>
<thead>
<tr>
<th>Experience</th>
<th>University A (n = 508)</th>
<th>University B (n = 258)</th>
<th>University C (n = 102)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eat at an International Restaurant</td>
<td>60 (0.90)</td>
<td>83 (0.93)</td>
<td>8 (6.27)</td>
</tr>
<tr>
<td>Listen to international speaker in school/ workplace</td>
<td>19 (3.11)</td>
<td>8 (7.98)</td>
<td>1 (9.80)</td>
</tr>
<tr>
<td>Listen to international speaker in religious setting</td>
<td>15 (2.32)</td>
<td>3 (6.05)</td>
<td>9 (8.04)</td>
</tr>
<tr>
<td>International Festival or Arts (music, dance, play, museum) in the U.S.</td>
<td>07 (0.75)</td>
<td>7 (7.60)</td>
<td>2 (0.78)</td>
</tr>
<tr>
<td>Host an international visitor</td>
<td>13 (2.24)</td>
<td>1 (9.77)</td>
<td>9 (8.63)</td>
</tr>
<tr>
<td>International Church Mission</td>
<td>10 (1.65)</td>
<td>9 (8.99)</td>
<td>2 (1.76)</td>
</tr>
<tr>
<td>Lived abroad</td>
<td>03 (0.28)</td>
<td>6 (0.08)</td>
<td>5 (4.71)</td>
</tr>
<tr>
<td>Take a class on international issues</td>
<td>4 (8.50)</td>
<td>2 (6.28)</td>
<td>5 (4.51)</td>
</tr>
<tr>
<td>International Trip</td>
<td>3 (8.1)</td>
<td>1 (9.77)</td>
<td>3 (2.55)</td>
</tr>
<tr>
<td>Military Service</td>
<td>9 (3.58)</td>
<td>7 (4.34)</td>
<td>1 (0.78)</td>
</tr>
<tr>
<td>Host an exchange student</td>
<td>8 (.45)</td>
<td>3 (.91)</td>
<td>0 (.80)</td>
</tr>
<tr>
<td>Short-term Study Abroad (1-6 weeks)</td>
<td>6 (.06)</td>
<td>7 (.59)</td>
<td>0 (.80)</td>
</tr>
<tr>
<td>Semester-long Study abroad</td>
<td>1 (.10)</td>
<td>.71 (.88)</td>
<td></td>
</tr>
</tbody>
</table>

**Objective Two: Determine Parents’ Perceptions of Study Abroad Based on each Institution**

The goal of objective two was to describe parents’ perceptions of study abroad at each institution. To understand perceptions of study abroad, participants were asked (a) what academic level is most appropriate to study abroad, (b) what time of year would be most valuable to study abroad, (c) the appropriate amount of time to spend on a study abroad, and (d) the appropriate cost for a study abroad (see Table 2).
At each institution, parents identified junior year as the ideal time to study abroad (see Table 2) and summer as the ideal time of year to study abroad (see Table 2). Regarding length of time, participants at all institutions reported that they preferred shorter-term study abroad programs. Universities A and B, 4-6 weeks was the most common answer, while at University C, 1–3 weeks was the most common answer. Regarding parents’ perceptions about appropriate cost of a study abroad program, the most common response at University A was $3001–$4000, while the most frequent response at Universities B and C was $2001–$3000.

Objective Three: Determine Parents’ Valuation of Study Abroad

Objective three was to describe parents’ valuation (i.e., perceived importance and likelihood of support) of study abroad programs at each institution (see Table 3). Parents were asked to rank how important they believed studying abroad was to their students’ academic experience, and how likely they were to support their student’s participation in a study abroad program.

Table 3 shows parents’ perception of importance of study abroad and likelihood to support study abroad participation. Parents of incoming agriculture students at each institution perceived study abroad to be somewhat important. Parents at University C (\(\bar{x} = 2.95; \sigma = 0.99\)) held the highest perception of the importance of study abroad, while parents at University B had the lowest (\(\bar{x} = 2.51; \sigma = 0.88\)). Further, parents at each institution indicated they were somewhat likely to support their child’s decision to study abroad. Parents at University C had the highest mean (\(\bar{x} =3.29; \sigma = 0.95\)), while parents at University B held the lowest mean (\(\bar{x} = 2.99; \sigma = 0.95\)).
Table 2

Parents of Incoming Undergraduate Agriculture Students Perceptions of Study Abroad

<table>
<thead>
<tr>
<th>Category</th>
<th>University A (n = 508)</th>
<th>University B (n = 258)</th>
<th>University C (n = 102)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>f</td>
<td>%</td>
<td>f</td>
</tr>
<tr>
<td><strong>Academic Level</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Freshman</td>
<td>21</td>
<td>4.13</td>
<td>4</td>
</tr>
<tr>
<td>Sophomore</td>
<td>88</td>
<td>17.32</td>
<td>45</td>
</tr>
<tr>
<td>Junior</td>
<td>258</td>
<td>50.79</td>
<td>149</td>
</tr>
<tr>
<td>Senior</td>
<td>56</td>
<td>11.02</td>
<td>26</td>
</tr>
<tr>
<td>Graduate Student</td>
<td>36</td>
<td>7.09</td>
<td>17</td>
</tr>
<tr>
<td>No Response</td>
<td>49</td>
<td>9.65</td>
<td>17</td>
</tr>
<tr>
<td><strong>Time of Year</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fall semester</td>
<td>20</td>
<td>3.94</td>
<td>19</td>
</tr>
<tr>
<td>Spring Semester</td>
<td>93</td>
<td>18.31</td>
<td>68</td>
</tr>
<tr>
<td>Summer</td>
<td>297</td>
<td>58.46</td>
<td>131</td>
</tr>
<tr>
<td>Intercession periods</td>
<td>59</td>
<td>11.61</td>
<td>28</td>
</tr>
<tr>
<td>No Response</td>
<td>39</td>
<td>7.68</td>
<td>12</td>
</tr>
<tr>
<td><strong>Length of Time</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>44</td>
<td>2.76</td>
<td>6</td>
</tr>
<tr>
<td>1-3 Weeks</td>
<td>98</td>
<td>19.29</td>
<td>38</td>
</tr>
<tr>
<td>4-6 Weeks</td>
<td>238</td>
<td>46.85</td>
<td>117</td>
</tr>
<tr>
<td>11-15 Weeks</td>
<td>40</td>
<td>7.87</td>
<td>17</td>
</tr>
<tr>
<td>Full Semester</td>
<td>84</td>
<td>16.54</td>
<td>73</td>
</tr>
<tr>
<td>6 Months to 1 year</td>
<td>9</td>
<td>1.77</td>
<td>1</td>
</tr>
<tr>
<td>No Response</td>
<td>25</td>
<td>4.92</td>
<td>6</td>
</tr>
<tr>
<td><strong>Appropriate Cost</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than $1000</td>
<td>55</td>
<td>10.83</td>
<td>33</td>
</tr>
<tr>
<td>$1,000 - $2,000</td>
<td>73</td>
<td>14.37</td>
<td>41</td>
</tr>
<tr>
<td>$2,001 - $3,000</td>
<td>110</td>
<td>21.65</td>
<td>68</td>
</tr>
<tr>
<td>$3,001 - $4,000</td>
<td>133</td>
<td>26.18</td>
<td>56</td>
</tr>
<tr>
<td>$4,001 - $5,000</td>
<td>73</td>
<td>14.37</td>
<td>37</td>
</tr>
<tr>
<td>More than $5,000</td>
<td>30</td>
<td>5.91</td>
<td>16</td>
</tr>
<tr>
<td>No Response</td>
<td>29</td>
<td>5.71</td>
<td>7</td>
</tr>
</tbody>
</table>
Table 3

Parents of Incoming Undergraduate Agriculture Students Perception the Importance of and Likelihood to Support Study Abroad

<table>
<thead>
<tr>
<th></th>
<th>University A</th>
<th>University B</th>
<th>University C</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(n = 508)</td>
<td>(n = 258)</td>
<td>(n = 102)</td>
</tr>
<tr>
<td>Importance of Study Abroad</td>
<td>2.75</td>
<td>2.51</td>
<td>2.95</td>
</tr>
<tr>
<td></td>
<td>1.00</td>
<td>0.88</td>
<td>0.99</td>
</tr>
<tr>
<td>Likelihood to Support Child’s Study Abroad</td>
<td>3.21</td>
<td>2.99</td>
<td>3.29</td>
</tr>
<tr>
<td></td>
<td>0.89</td>
<td>0.95</td>
<td>0.95</td>
</tr>
</tbody>
</table>

Note. Real Limits –Very Unimportant/Not Likely = 1.00–1.49; Somewhat Unimportant/Somewhat Unlikely = 1.50–2.49; Somewhat Important/Somewhat Likely = 2.50–3.49; Very Important/Very Likely = 3.50 – 4.00.

Conclusions and Discussion

The most common international experiences were eating at an international restaurant, listening to an international speaker at school/workplace, listening to an international speaker in a religious setting, and attending and international festival in the U.S. Very few parents indicated they or someone in their household had traveled abroad for any reason. This aligns closely with research by Bunch et al. (2013) who reported the most frequent international experience of undergraduate agriculture students was eating at an international restaurant and any form of study abroad was the least common experience.

Regarding perceptions of study abroad programs, parents believed that study abroad should be completed during their student’s junior year. Further, they believe that 4–6 weeks is the most appropriate duration and the summer when they would like their student to complete a study abroad experience. These results are similar to research conducted at Louisiana State University that found college of agriculture students believed that 4–6 weeks in the summer of their junior year was the most appropriate time to include a study abroad in their course of study (Bunch et al., 2015; Danjean et al., 2015). Overall, U.S. students do typically study abroad during their junior year, but since 2010, an increasing number of freshman and sophomores have studied abroad (Institute of International Education, 2014). Per TPB, Ajzen (2002) would describe the parents’ perceptions as the normative beliefs that could affect students’ decision whether or not to engage in the behavior of studying abroad. The perceived norm regarding cost of an experience is particularly noteworthy, given that parents and family are a primary fund source for most U.S. students’ participation in study abroad (Institute of International Education, 2014). The perceived norms regarding cost may be dysfunctional, as costs for effective study abroad programs can be significant.

Parents at each institution believe that study abroad is somewhat important to their student’s undergraduate experience. Additionally, parents indicated they are somewhat likely to support their child’s decision to study abroad. When viewing these results through the TPB lens, the parents’ perception that study abroad is important to the undergraduate experience indicates favorable normative beliefs surrounding the behavior of participating in a study abroad program (Ajzen, 2006). Assuming these students possess motivation to perform the behavior, their parent’s beliefs, as referent individuals, should not hinder their intention to study abroad (Ajzen, 1991).
Overall, parents have little international experience, believe that study abroad is important, believe that it should be held in a summer term of a student’s junior year and be 4-6 weeks long, costing less than $4,000.

**Recommendations**

Additional research is warranted to understand parental perceptions of international experiences better. Specifically, researchers should seek to identify predictors of parental support of international experiences, barriers to support, and ways to overcome those barriers. Regional and national studies of this nature should be conducted to determine if differences exist based on location and to further strengthen the body of knowledge in this area. Employing qualitative approaches to inquiry could provide additional understanding of parental perceptions to study abroad.

Parental beliefs and values may impact their decision to support study abroad. Further research should explore potential factors, such as previous international experiences or additional psychographics may be predictors of likelihood to study abroad. Administrators and faculty should consider parent expectations and value when planning study abroad, and work to provide education and outreach to enhance value beliefs and normative beliefs of parents.

University faculty and administration should consider these and the findings of other research when designing study abroad opportunities for agriculture students. Specifically, these opportunities should focus on short-term, summer programs, as these would be most consistent with parents’ expectations and beliefs. Offering short-term, summer based international experience opportunities has the potential to meet parents’ expectations, and increase likelihood that their beliefs would align with a decision to support student participation. Additionally, universities should strive to ensure study abroad programs are affordable for all students. Relationships should be built and maintained with host sites to ensure the most efficient use of funds. Further, scholarship opportunities should be created to supplement student and/or parent funds to reduce the cost apprehension that may be associated with study abroad.

Finally, universities and practitioners should seek to engage parents with current and accurate information about the nature, benefit, and cost of study abroad. Armed with evidence that parents value study abroad, but expect costs to be less than they actually are, highlights a possible knowledge gap, communication disconnect, or barrier. Enhanced marketing efforts, outreach, and education may impact those possible barriers. These linkages should be explored in future research.

**References**


Exploring How Pedagogical Strategies Change Student Perceptions of Writing Apprehension

Laura M. Fischer¹, Courtney A. Meyers² & Sinclaire E. Dobelbower³

Abstract

Writing skills are imperative for students in any career; however, many students have acknowledged avoiding courses that emphasize writing. These same students fail to learn proper mechanics during their post-secondary education. Writing intensive courses have served as a place where students have the opportunity to improve confidence, minimize avoidance-like attitudes, and improve writing techniques. Prior literature has found a relationship between self-efficacy and writing apprehension; additionally, research has suggested how pedagogical strategies can be used to improve self-efficacy. This study sought to explore how the implementation of pedagogical activities changes self-efficacy and the student’s level of writing apprehension. A qualitative research design allowed for a thick description of the students’ perceptions and reactions to pedagogical activities. The findings suggested pedagogical practices and the role of the instructor played important roles to improve student confidence in writing. Specifically, practicing writing, opportunities to edit and reflect, following a guide, and writing about what matters may be used in courses to improve confidence and writing skills. Additionally, the instructor should provide constructive criticism and serve as a coach during the learning process. In order to improve writing curriculum and student confidence toward writing, instructors should incorporate these recommendations into their curriculum.

Keywords: Writing apprehension, writing-intensive courses, post-secondary education, written communications, self efficacy

Introduction and Literature Review

Although written communication skills have been found to be imperative in any field a college graduate chooses, many college students avoid courses that focus on writing skills, and thus fail to learn proper mechanics during their post-secondary education (Belkin, 2015; Leef, 2013). Popular press authors have indicated employers are frustrated with their recent graduates’ lack of writing skills (Anderson, 2014; Selingo, 2012), and some have suggested college-level instructors must make student learning of writing skills a higher priority (Leef, 2013). Similarly, research in the realm of agricultural education and communications has discussed the need for agricultural education and communications graduates to have well-developed writing skills (Ahrens, Meyers, Irlbeck, Burris, & Roach, 2016; Davis & Jayaratne, 2015; Irlbeck & Akers, 2009; Morgan, 2010). Graduates within the agricultural sciences must be able to clearly, correctly, and articulately express

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themselves as they enter graduate school and the professional workplace setting (Lindner, Murphy, Wingenbach, & Kelsey, 2004).

Historically, agricultural communications programs, instructors, and faculty have emphasized writing as a necessary skill (Ahrens et al., 2016). Additionally, with a growing need for sophisticated written communications skills, instructors across the agricultural sciences have incorporated writing intensive assignments (Trojan, Meyers, & Hudson, 2016). Although instructors stress the need for students to improve writing skills, students have shown writing apprehension, or avoidance-like attitudes toward writing, causing them to not take writing courses seriously (Ahrens et al., 2016; Daly & Miller, 1975). In fact, writing apprehension is one of the main factors that affect a student’s motivation and confidence when writing. High writing apprehension also leads students to avoid the learning process (Daly & Miller, 1975; Daly, 1978).

Writing apprehension, a term coined by Daly and Miller (1975), describes the interaction between attitudes toward writing and an individual’s motivations, confidence, and skills to complete a written task. Writing apprehension occurs when an individual tends to avoid situations they perceive to demand writing and some form of evaluation (Daly, 1978). Daly (1978) explained that although students need some apprehension to be careful and attentive writers, high and low levels of writing apprehension have been found to be a barrier in the development of a student’s written communication skills (Faris, Golen, & Lynch, 1999). Apprehension is scored on a continuum from 26 to 130 with a mean of 75. Individuals with a score between 60 and 90 do not show a significantly unusual level of writing apprehension and tend to have the best motivation while writing. However, those with high writing apprehension tend to write with poor mechanics (grammar, spelling, and punctuation) and tone. Although those with low writing apprehension tend to not fear the writing process, these individuals may exhibit a lack of motivation to complete writing assignments and may be unmotivated to check their work for grammar, spelling, and punctuation errors (Daly, 1978). Although students may fear a writing task, the importance of learning these imperative writing skills is crucial to students’ career success (Leggette & Homeyer, 2015). In order to continue to improve writing curriculum in agricultural education and communications, faculty and instructors must understand the students’ fears and attitudes toward writing (Leggette & Jarvis, 2015) and identify techniques to help students overcome these fears.

Writing intensive courses have served as places where students are able to improve their confidence and writing techniques (Leggette, McKim, & Dunsford, 2013; Trojan et al., 2016). These courses are dependent upon teachers who develop effective pedagogical strategies and coach or train students to develop writing skills (Leggette, 2015; Trojan et al., 2016). According to Hudd, Sardi, and Lopriore (2013), writing instructors perform two roles in the writing intensive course: 1) to act as coaches who help students to guide discovery, creativity, and critical thinking, and 2) to act as teachers who help students understand the proper writing components and standards of grammar, spelling, and punctuation. However, the teaching of writing is time consuming and many students fail at writing because the instructors do not provide enough time or effort to coach students through the learning process (Bean, 2011; Leggette, 2015). Instructors must be able to “help their students during the development stages of the writing process” (Leggette, 2015 p. 104) by providing a varied amount of “assignments, resources, reaction, and instruction” (p. 107).

**Theoretical Framework**

The concept of self-efficacy, a component of social cognitive theory, was used as a framework to explain how pedagogical strategies and the role of the instructor contributed to a change in writing apprehension throughout the duration of a one-semester writing intensive course. According to Bandura (2012), social cognitive theory explains how “human functioning is a
product of the interplay of intrapersonal influences, the behavior individuals engage in, and the environmental forces that impinge upon them” (p. 11). This theory has been used to describe how an instructor should begin to understand the motivation of the student by exploring the student’s interpersonal experiences, behavior, and environment. Bandura (1995) noted a major component of social cognitive theory was self-efficacy, or internal disposition. This concept explained how “beliefs people hold about their abilities and about the outcome of their efforts powerfully influence the ways in which they will behave” (Pajares & Johnson, 1994, p. 313). The premise of social cognitive theory reflects how someone’s behavior, or motivation toward an action, was shaped by their beliefs in their capabilities (Bandura, 1986; Pajares & Johnson, 1994). Writing apprehension has also been used to judge a person’s competence as he thinks about or performs a writing task and to identify a person’s general self-esteem level when performing a writing task (Daly & Wilson, 1983; Fischer & Meyers, 2017). Further, Pajares and Johnson (1994) found writing apprehension had a strong relationship with self-efficacy. Because self-efficacy is used to describe an individual’s beliefs about their capabilities, the more a student fears or has apprehension toward writing, the more likely the student will not have confidence in his or her capabilities as a writer (Fischer & Meyers, 2017; Pajares & Johnson, 1994; Trojan et al., 2016).

Prior research has suggested students’ writing apprehension level can be influenced by increasing self-efficacy (Fischer & Meyers, 2017; Martinez, Kock, & Cass, 2011; Matoti & Shumba, 2011; Pajares, 2003). Further, teaching strategies and the role of the instructor have been proven to affect students’ ability to be effective writers (Leggette, 2015). Bandura (1977) identified four factors of self-efficacy that influence confidence through teaching strategies and instructor characteristics: performance accomplishments, verbal persuasion, vicarious experience, and psychological states. Because writing self-efficacy beliefs and writing performances are related, the researchers sought to identify how an individual’s level of self-efficacy may be influenced by these four factors in a writing intensive course.

Performance accomplishments refer to the personal mastery of a specific task (Bandura, 1977). Similar to other skills, learning to write properly requires repeated practice for a long duration of time (Trojan et al., 2016; Kellogg & Raulerson, 2007; Leggette et al., 2013). Courses involving a writing intensive component allow students to complete multiple assignments and the opportunity to improve their writing skills (Fischer & Meyers, 2017; Trojan et al., 2016). Within these courses, students may immerse themselves in a writing-rich environment (Leggette & Homeyer, 2015). These courses provide opportunities for both small in-class writing assignments as well as larger out-of-class assignments to be evaluated (Leggette & Homeyer, 2015). In addition to providing opportunities to practice writing, these courses also provide places where teachers can push effective writing strategies to higher quality levels. Therefore, continuous practice and multiple assignments may allow individuals to increase their self-efficacy with the completion of these successful tasks and assignments.

While repeatedly gaining success with a task may help to increase self-efficacy, verbal persuasion is another factor that helps students gain confidence in their writing abilities. Verbal persuasion refers to feedback that proves to individuals they had the knowledge and abilities to achieve a task at hand (Bandura, 1977). When an instructor uses verbal persuasion, it gives the students the information they need to improve on a task such as written or verbal feedback on an assignment (Margolis & McCabe, 2006). Instructors should provide students with positive feedback on their writing performance several times during the course as it is pivotal in helping improve students’ writing competency (Kellogg & Raulerson, 2007; Leggette et al., 2013; Pajares & Johnson, 1994). Continuous feedback throughout the semester gives the students the opportunity to “learn from their mistakes and improve on the next assignment” (Leggete & Homeyer, 2015, p. 119). Although instructor feedback is pivotal to success, “feedback may be given by the students.
themselves if the right conditions exist” (Leggette et al., 2013, p. 2). Further, instructors have used writing intensive assignments to help train students to become better writers ([Authors], 2017). Because writing is “more than rules,” and is a complex procedure, writing must be evaluated through continuous assessment and critical feedback (Legette et al., 2013, p. 2). As Pajares (2003) stated, “positive persuasions may work to encourage and empower; negative persuasions can work to defeat and weaken self-beliefs” (p. 140). By providing positive feedback and support, students may feel the motivation to complete a task at hand (Crumbo, 1999) while also learning and improving their techniques (Leggette et al., 2013).

Vicarious experiences can be used to increase self-efficacy to show a successful model of completing a task. Bandura (1977) explained, “seeing others perform threatening activities without adverse consequences can generate expectations in observers that they too will improve if they intensify and persist in their efforts” (p. 197). Writing intensive courses have served as a place where students may observe others performing tasks (Pajares, 2003) such as peer review sessions and examples. As a student views others completing a task, the student will make social comparisons, which “can be powerful influences on developing self-perceptions of competence” (Pajares, 2003, p. 140). One method teachers have used to teach writing is to provide clearly articulated examples of written tasks (Leggette & Homeyer, 2015). However, examples can hinder students’ creative thinking. To overcome lack of creativity, teachers can provide guidance by assigning readings of well-written documents, providing rubrics that address project requirements, and encouraging outlines that help students structure their assignments (Leggette & Homeyer, 2015). Additionally, repetitious project building tasks where students develop a larger project throughout the semester by combining different writing assignments may allow students to develop “their own thoughts and ideas while reflecting on their own thinking” (Leggette & Homeyer, 2015, p. 119).

Efficacy beliefs have been connected to physiological states such as anxiety and stress (Pajares, 2003). In order to decrease anxiety, students must be given the chance to increase self-belief in themselves (Kellogg & Raulerson, 2007). Writing is an emotional and psychological process just as much as a cognitive activity (McLeod, 1987). Self-confidence may be increased through Mascle’s (2013) self-reflection. In Mascle’s (2013) model, conversations and self-reflections were used to help students believe they have the power and capability to be a successful. In these self-reflections, students must be given adequate time to allow for both “mental and emotional engagement in the recent experience (Kolb, 1984; Proudman, 1992). During this time, students must be encouraged to make holistic pictures or generalizations about their learning that can then be applied to their lives (Meyers & Arnold, 2015) and future writing endeavors. Leggette et al. (2013) also found that self-reflection and evaluation is a “valuable learning tool that could enhance student’s performance, attitudes, and self-efficacy” (p. 3). Because self-reflection pertaining to assignments allow students to self-identify and recognize what needs to be improved, students who then assess their own work may be better able to identify and correct mistakes before submitting assignments (Leggette et al., 2013). Additionally, self-reflection forces students to understand what attributes are necessary for higher quality writing materials (Andrade, 2008; Leggette et al., 2013).

**Purpose & Research Questions**

Both academics and employers have suggested college students need to improve their writing skills. As agricultural educators, faculty and instructors must find ways to develop a sufficient scientific and professional workforce that addresses the challenges of the 21st century (Roberts, Harder, & Brashears, 2016) and sophisticated writing skills in students are necessary to do so. Prior research has suggested writing apprehension is a major factor contributing to student
avoidance to learn writing skills (Daly & Wilson, 1983). However, writing apprehension may be diminished and skills may be improved by increasing the students’ self-efficacy (Pajares & Johnson, 1994). Further, in one writing intensive course, [Authors] (2017) found many students lessened their writing apprehension. Based upon the need to improve self-efficacy to change writing apprehension, the purpose of this study was to explore how the factors of self-efficacy influence agricultural student perceptions of writing apprehension in a writing intensive course at Texas Tech University. The following research questions were used to achieve the purpose:

**RQ1:** What pedagogical strategies helped students gain confidence and motivation toward writing?

**RQ2:** What was the role of the instructor in helping to change students’ perceptions and attitude toward writing?

### Methods

Qualitative methodology has often been used to understand complex phenomenon such as attitudes and behaviors toward completing tasks, because this approach allows researchers to derive thick descriptions of a scenario or situation (Erlandson, Harris, Skipper, & Allen, 1993). In this study, the researchers examined student self-reflections to understand the participants’ experiences in a writing intensive course and to understand how specific course activities impacted students’ perceptions of writing apprehension. A case study of students enrolled in a required writing course at Texas Tech University for the College of Agricultural Sciences and Natural Resources allowed the researchers to investigate a “phenomenon within its real-life context” (Merriam, 1998, p. 21). The population for this study was all previous and future students enrolled in ACOM 2302: Scientific Communications in Agriculture and Natural Resources at Texas Tech University. The sample was comprised of 92 students enrolled in the Spring 2015 semester as these students are assumed to be representative of all students who take this course. This population was selected because students enrolled in previous semesters had expressed fear and avoidance-like attitudes to completing written assignments (Fischer & Meyers, 2017), and this sample was chosen as the researcher had access to students in several majors with varying levels of writing apprehension. Student majors were animal science, crop and soil science, horticulture or turf grass science, agricultural education, and agricultural and applied economics. The majority of students were freshmen or sophomores.

To determine writing apprehension scores, students were asked to take Daly and Miller’s (1975) writing apprehension test at the beginning (week 1) and end of the semester (week 15) to determine their writing apprehension scores. Student WA scores were disseminated to students after the completion of both the pre-test and post-test. [Authors] (2017) found a significant difference between pre-test and post-test scores and students demonstrated an improvement in writing apprehension throughout the semester.

At three points during the semester, students completed self-reflections about their experiences in the course. In each of the reflections, students commented on instructional techniques, writing projects, and changes in writing apprehension. Merriam (1998) discussed documents as the “umbrella term to refer to a wide range of written, visual, and physical material relevant to the study at hand” (p. 112). The documents were gathered and analyzed in order to understand how different factors of self-efficacy affected student perceptions of writing. Table 2 provides the prompts students answered in their reflections.
Table 2

Writing Reflection Prompts

<table>
<thead>
<tr>
<th>Writing Reflection</th>
<th>Date of Reflection</th>
<th>Number of Reflections</th>
<th>Prompt</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reflection 1</td>
<td>Week 5</td>
<td>81</td>
<td>Describe how your confidence toward writing has changed throughout the semester, so far.</td>
</tr>
<tr>
<td>Reflection 2</td>
<td>Week 10</td>
<td>76</td>
<td>Describe how your motivation toward writing has changed throughout the semester. What factors have helped to change your writing apprehension?</td>
</tr>
<tr>
<td>Reflection 3</td>
<td>Week 16</td>
<td>78</td>
<td>Describe how course assignments, in-class activities, feedback on grading, self-reflection assignments, or other aspects of the course have changed your confidence and/or motivation toward writing.</td>
</tr>
</tbody>
</table>

*Note:* Number of reflections differs due to student attendance during that particular class day.

Because self-reflections were assigned as course assignments, the students received a grade if they responded and were required to provide their name. After a grade was assigned, pseudonyms were used prior to data analysis to protect the student’s identity and minimize researcher bias because the main researcher was the instructor of the course. These pseudonyms are used in the manuscript to verify that the quotations are from many students.

To demonstrate trustworthiness of the data collection, the researchers used data triangulation via the collection of three self-reflections to improve the credibility of the study (Guion, Diehl, & McDonald, 2011). Additionally, this research was part of a larger study that also included interviews, observations, questionnaires, and other self-reflections, which provided validity checks across the data sources (Lincoln & Guba, 1990). The self-reflections were analyzed independently and are the only data sources reported in the manuscript. Peer debriefing was used to develop quality reflection questions (Erlandson et al., 1993). Although students were not given a page limit or minimum length, they were asked to write in complete sentences and paragraphs to develop thick descriptions to demonstrate transferability, or the degree in which the findings can be translated to another setting, situation, or participants (Erlandson et al., 1993).

The student reflections were analyzed using thematic analysis via open and axial coding for specific themes (Glaser & Strauss, 1967). The lead researcher, a doctoral student in agricultural communications who was also the course instructor, analyzed the data after final grades were assigned. The immersion of a writing instructor into the student's assignments is necessary for the development of the student’s writing skill. Although this immersion leads to bias, the instructor bias was minimized through the use of pseudonyms, transcription to text, and multiple investigators confirming themes. Throughout the study, the researcher documented a “running account of the process of inquiry” in an audit trail (Erlandson et al., 1993, p. 34). The audit trail detailed theme formation, document organization, and researcher notes. An additional researcher approved the questions for self-reflection and confirmed the themes that emerged from the data analysis process (Erlandson et al., 1993). Texas Tech University Institutional Review Board approved the procedures for this study before data collection.
Findings

**RQ1: What pedagogical practices helped students gain confidence and motivation toward writing?**

Thematic analysis of student self-reflections revealed the following pedagogical strategies changed students’ writing apprehension throughout the semester: *good practice makes perfect, opportunities to edit, opportunities to reflect, following a guide, and write about what matters.*

**Good practice makes perfect.** The students discussed how multiple writing tasks and assignments during the semester helped them become more comfortable or confident with the writing techniques. Michaela explained how writing more often makes her more at ease with the process. She said, “I think I am more comfortable writing because we have been writing so often for this class” (Michaela, Reflection 1). Vivian discussed how she has been able to improve her writing skills through practice. She said, “I definitely feel a lot more confident. I think this class has given me a lot of opportunity to practice” (Vivian, Reflection 2). Seth discussed, “With multiple writing assignments, I have had more opportunities to improve my writing” (Seth, Reflection 2). Casey revealed that completing several writing assignments helped him improve his writing skills:

> Having multiple writing assignments and continuously having feedback returned back with it. I can better myself. The first one I was really nervous about when we turned and talked about our writing apprehension, but as things go on it continuously gets better. I think I can do this I can do better. I can ace this. I know how to do it. It is almost a muscle memory similarly to a sport. Like in basketball you shoot muscle memory for free throws and it’s I feel it is just as long as you can keep doing it over and over again it will work out. (Casey, Reflection 2)

In the third reflection, it became more apparent that students felt multiple writing assignments helped them perfect their writing. Cory discussed how it helped him practice his writing when he said, “[Feedback] impacted it greatly through practice makes perfect. Though I still have more improvement, repetition and getting feedback had a huge effect on my skills and techniques” (Cory, Reflection 3). Vivian also stated, “I think my attitude toward writing changed throughout the course. Practice does make me feel more confident about writing” (Vivian, Reflection 3).

Students also discussed how in-class activities helped to engage their interest and give them experience before completing larger assignments. Cory explained, “I’m a big fan of class activities because it actually helps engage my interest even further” (Cory, Reflection 1). Jared discussed how the in-class activities help to give him more experience when he said, “The activities are helpful because it gives me more experiences to write” (Jared, Reflection 1).

Although the majority of the students stated how continuous practice helped them to improve their writing, some students explained how it made them more fearful of writing. “I am a little more afraid to write because I am noticing a lot more errors than previously found. I’m taking two writing intensive courses, so all the assignments are piling up on me” (Omar, Reflection 2).

**Opportunities to Edit.** The theme of peer editing emerged in the final reflection. The students expressed how editing peer assignments helped them to understand the mistakes of others, which helped them to recognize their own mistakes. David explained, “The peer reviews gave me an opportunity to edit others work which allowed me to eventually begin correcting my mistakes” (David, Reflection 3). Houston explained how peer edits helped him to realize his mistakes before
turning in his papers when he said, “My favorite part of this course was peer editing. This helped me know what I need to work on to get a better grade next time” (Houston, Reflection 3). However, as stated by Austin, the peer review experience depends upon the quality of the peer reviewer, “Sometimes peers do not give enough feedback on your work” (Austin, Reflection 2).

Opportunities to Reflect. At various points during the semester, students were asked to spend one minute reflecting upon their grade and feedback on some of their returned assignments. Terri explained how she thought the one-minute papers were the perfect time for her to reflect on what she was learning. “The reflections [one-minute papers] allow me to reflect on what I am learning and to ensure I understand it” (Terri, Reflection 2). Shelby discussed how it made her think about her assignments in detail when she said, “I think the reflections help a lot because it lets me sit and think about the grade I got and why” (Selby, Reflection 1). One student, Mariela, stated it prompted more writing, “I feel that I may enjoy writing a lot more than I did before. I actually started a journal just to write” (Mariela, Reflection 1). In the third reflection, Michaela showed more confidence, “I think by doing reflections on my writing, I have got more comfortable having my writing reviewed and edited” (Michaela, Reflection 3). One student explained how she did not find value in reflecting, “I don’t think I put much thought into the reflections. So, I don’t think that they raised or lowered my score by any means. I just wrote something down” (Amy, Reflection 2).

Following a Guide. Writing examples helped them to understand what is expected of them when completing assignments. Cory explained how examples help him improve his writing. “It [examples] has helped me a bunch because I have been able to use them to better my writing” (Cory, Reflection 2). Savannah reflected, “The examples are the best assistance in creating a good paper” (Savannah, Reflection 2). London discussed how examples have helped him to check if his assignments were correct. “I believe my writing apprehension has gone down a little due to the detailed rubrics and examples, which made it easier to check if I am formatting and writing the correct way” (London, Reflection 1). Carly explained how writing was made easier: “Writing is still not my favorite thing in the world. It has been made easier because we have guidelines and examples. If I could always have those writing would not be that bad” (Carly, Reflection 1).

In the third reflection, the idea of organization techniques, or laying out assignments in an organizational manner, was expressed as a tool that helped students understand how to complete an assignment in separate steps. For example, students were provided an outline of the information that should be included in a cover letter. Brandyn explained, “The organizational techniques helped me organize my papers to keep my writing and formatting in order” (Brandyn, Reflection 3). Dylan reflected about how it helped him write in a more methodical fashion when he said, “Instead of looking at it as a whole paper, I break it down into sections” (Dylan, Reflection 3). Vivian expressed how organizing the material into steps helps to make a project less stressful when she said, “The step-by-step building the big project. I really like having my project into broken into smaller pieces to work on and then they all come together at the end. It is really helpful and less stressful” (Vivian, Reflection 3). Further, Alexis said, “Smaller assignments leading to bigger ones helped to curb my anxiety toward a project” (Alexis, Reflection 3).

Write About What Matters. Students explained how their interest in the subject matter or the topic at hand increased their motivation and decreased their fear toward completing the writing task. “My motivation toward writing has increased due to the research paper because it is something I am passionate about. Allow us to write more about what we are passionate about” (Tate, Reflection 2). Richard explained that picking their topics was interesting. “I like writing about things I am interested in that is more motivation than an English class writing about Romeo and Juliet” (Richard, Reflection 2). In Richard’s second reflection he said, “I enjoy writing for a
purpose not just, writing to write” (Richard, Reflection 1). Similarly, Kelsey explained, “Allowing me to write about my own topic will be a huge help when it comes down to writing my paper” (Kelsey, Reflection 2).

Students expressed how business-writing assignments helped to prepare them for their careers. Nick explained how the assignments were useful to preparing him for the workplace:

Assignments that were gone over in the class helped me to realize my writing lows and correct them for future endeavors. I will use what I learned in course assignments to better my writing in the workplace. Clearly, professionalism is an essential there [in the workplace] and this class helped me in that aspect. (Nick, Reflection 3).

Kelsey stated how writing projects that are similar to what she will use in her career helped her to become less apprehensive. She said, “My writing apprehension has changed somewhat because it has become easier for me to write professionally for future references and employers” (Kelsey, Reflection 1).

RQ2: What was the role of the instructor in helping to change student's attitude toward writing?

Analysis of the reflections revealed that the instructor played a role in helping the students diminish their writing apprehension throughout the semester. The following instructor practices helped to change self-efficacy and writing apprehension: nothing but the truth and instructor as a coach.

Nothing but the Truth. Throughout the semester, the majority of students reflected about how feedback made an impact on their writing apprehension. Students discussed how constructive criticism of positive and negative aspects of their writing helped them to improve. Further, students indicated that feedback helped to increase their confidence in writing. Macee said, “I was fairly confident about my writing before and have gained more confidence after seeing feedback. I am pleased with the feedback I have had on my work” (Macee, Reflection 2). Savannah suggested feedback improved her assignments, “Feedback has helped me because it helps me know what I need to change and gives me confidence in my writing” (Savannah, Reflection 1). Taylor simply explained, “I feel as though the feedback in this class has been the biggest factor in improving my writing apprehension” (Taylor, Reflection 1). Carly stated, “Because I was super self conscious of my writing, I always put it off because I didn’t want others to read it or be judged by it. But now, I do the writing assignments right away because I like the feedback” (Carly, Reflection 3).

Students discussed how constructive feedback was necessary to understand the material. Cassidy said constructive criticism helps to make her aware of mistakes when she said, “Continue giving feedback, both positive and negative, on the assignments. The feedback helps enforce good habits and gives a nudge in the right direction on the bad ones” (Cassidy, Reflection 2). Brady discussed, “Having all this feedback has helped me to understand the material better by showing what to do/what not to do, and how to fix anything” (Brady, Reflection 2). Brandon discussed how it helps him to learn through his mistakes when he said, “Keep offering praise for positive aspects of assignments and harsh criticism when necessary. Everyone learns through mistakes, but we must be aware of these mistakes” (Brandon, Reflection 2). In the third reflection, Kelsey explained, “The biggest impact on my writing apprehension in this class was feedback when my work was graded. It made it easy for me to see exactly what I needed to work on” (Kelsey, Reflection 3). Further, Trevor explained how feedback must be clear for the student to understand, “Sometimes I would
like to have more explanation of what I did wrong on the paper and what I have done well. I would like it to be more critical.” Amy also explained how at first feedback hurt her feelings,

At first, it [feedback] made kind of upset in a way because I put a lot of effort into this type of project because it is something that I will use – resume and cover letter – Especially since I took it to the writing center and still had a lot of marks on my paper. (Amy, Reflection 2)

Instructor as Coach. Another dominant theme was the idea of the instructor motivating the students. Students explained how instructor motivation impacts motivation and confidence toward writing. Lynn explained how talking through assignments improved her understanding. “The instructor and TAs [teaching assistants] have helped me to understand the material very well. This motivates me to do better work.” (Lynn, Reflection 2). Nick discussed how it helped him when the instructor went over the assignments. “Y’all do a great job of talking through the assignments which is really helpful when completing them” (Nick, Reflection 2).

Another thing the instructor did was create a classroom environment that improved motivation. “[My] favorite part would be the classroom environment. I liked how we are given the opportunity to freely ask questions and speak out our thoughts” (Cynthia, Reflection 3). Vivian also explained how an approachable instructor made it easier to ask questions and to discuss her issues, “It is easy to ask questions and discuss my issues” (Vivian, Reflection 3). Macee said, “The lectures and PowerPoint’s were very helpful to see how things should be done and determine what is correct and what is incorrect in writing” (Macee, Reflection 3).

Terri reflected on how the instructor in another course caused her to have writing apprehension:

I have had several different professors. This one [professor] is big into research and the way he comes off is a little scary. He makes me scared to death to write, and I don’t know what he is looking for. Others are like, “Have fun with it. We want you to enjoy this, and we want you to be able to use this knowledge to help you go further in your career and studies.” (Terri, Reflection 3).

Similarly, Casey explained how instructors play a role in his writing apprehension:

Because of my first English course, where I probably had the hardest professor that I have had throughout my career. I ended up with a C, and I barely got that C. It was just frustrating! What’s wrong with it? That’s why my writing apprehension is so high is because of that class and that teacher. (Casey, Reflection 2)

Conclusions and Discussion

Post-secondary scholars and employers alike have discussed the need for college graduates to be proficient in their writing skills when they enter the workforce (Belkin, 2015; Leef, 2013). Although instructors in college classrooms may stress the importance of writing in future careers, students may still show a lack of motivation or confidence to write (Leef, 2013). Writing apprehension, or the level of fear and the lack of confidence toward writing, has been characterized as a major factor influencing student motivation to master their writing skills (Daly & Miller, 1975). Teaching strategies and the role of the instructor have also been found to impact the effectiveness of students to learn writing skills in the classroom (Leggette, 2015). The researchers explored how specific components of self-efficacy (performance accomplishments, verbal persuasion, vicarious
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experience, and psychological states) helped to minimize writing apprehension and increase confidence in writing skills through the use of pedagogical strategies and the instructor interventions in a large-enrollment writing course for agricultural science majors.

During and at the end of the course, the students reflected upon how classroom strategies influenced their writing apprehension. The emergent themes of good practice makes perfect, opportunities to edit, opportunities to reflect, following a guide, and write about what matters provided implications regarding what strategies make students better writers. These themes are similar to what other researchers have identified as strategies that can be used in the classroom to impact writing apprehension (Kellogg & Raulerson, 2007; Martinez et al., 2011; Matoti & Shumba, 2011; Pajares, 2007). The instructor was also identified to play a key role in providing guidance to students when enrolled in a writing intensive course through the emergent themes of nothing but the truth and instructor as a coach.

When compared to the four factors of self-efficacy, each of the themes could be placed in a specific area of self-efficacy: performance accomplishments (good practice makes perfect), verbal persuasion (nothing but the truth, opportunities to edit), psychological states (opportunities to reflect, writing about what matters, instructor as a coach), and vicarious experience (following a guide). The ability to complete multiple assignments during the semester helped improve student’s confidence toward writing. Similar to prior literature, continuous practice allows students to use their writing skills, learn from their mistakes, and perform with a higher quality (Leggette, 2015). When the instructor provides verbal persuasion such as constructive criticism and allows students the opportunity to edit their work and the work of others, students are given the information they need to improve upon tasks and skills (Margolis & McCabe, 2006). The findings of this study suggested when detailed feedback is given multiple times throughout the semester, the students know exactly what needs to be fixed, how to fix it, and how to use the information in later assignments (Leggette et al., 2013; Pajares & Johnson, 1994). The process of modeling was also recognized in the student comments regarding the instructor providing detailed outlines and rubrics as well as reading assignments to share examples of the type of assignments to be completed. Although Leggette and Homeyer (2015) indicated too many examples may inhibit creativity in writing as students may feel constrained to the work of others, the examples and outlines provided guides of prior completed work, while outlines and rubrics provided questions to promote independent thoughts and ideas when writing. Additionally, the students suggested the self-reflection and peer review activities enabled evaluation of their own work as well as the work of others. By understanding how their work and the work of others could be improved, the students invested mental and emotional engagement in a recent experience, and the students were encouraged to generalize about their own learning (Leggette et al., 2013; Meyers & Arnold, 2016). Additionally, the emergent theme of the instructor as a coach provided students with encouragement to believe they have the capability to be successful writers. Students also addressed that if the instructor inhibited their confidence, they would not perform well in a course nor would they be confident in their writing.

Prior research has provided evidence that students’ writing apprehension level can be changed by increasing self-efficacy. Similar to the results of other studies (Leggette, 2015), the writing intensive course may facilitate improvement in writing skills and attitude toward writing. Findings from this study revealed unique and practical information for educators when planning courses focused on improving students’ writing. When classroom strategies are designed to increase a student’s confidence in a task, the student is able to become aware of how his or her writing techniques have changed during a semester. Although students expressed they were fearful of feedback on writing assignments at the beginning of the course, they learned constructive
criticism helped them notice and correct their mistakes. Additionally, when the students were able to write on topics that interested them, they provided more detail and attention to their assignments.

Students from a variety of disciplines need to be trained to write correctly because it is imperative for graduate education and as a professional in the workplace (Lindner et al., 2004). Teachers and instructors should use the results of this study to recognize writing apprehension does exist in undergraduate students. To change students’ writing apprehension, teachers should focus on developing curriculum structured to increase confidence and motivation toward writing. The results of this study provide recommendations to improve student confidence such as continuous feedback, multiple take home and in class assignments, self-reflection activities, and one-minute papers. Because prior research suggested reflection activities encourage critical and active thinking (Leggette et al., 2013; Meyers & Arnold, 2015), instructors should implement activities that allow students to reflect upon their writing skills. As an example, writing intensive assignments could be modeled in a scaffolding-type approach. This would involve students completing several minimal point value assignments, which the instructor then evaluates and critiques before students incorporate the feedback into a larger final project. Finally, at the end of the larger final project or assignment, the student could reflect upon the experience.

Future research in the realm of writing apprehension should focus on understanding the role of writing apprehension in other courses. Research should seek to identify how writing apprehension is affected when the identified pedagogical strategies are not implemented. The findings from this study were limited to one writing intensive course; therefore, future research should explore the role of writing apprehension at a national or state level on student perceptions of writing. This study could also identify how the role of the instructor changes a student’s perceptions of writing and ability to complete writing tasks to a high degree of quality. Quasi-experimental research to test various pedagogical strategies would provide empirical evidence regarding what techniques are most impactful in helping students become more confident writers. As instructors of writing intensive classes implement the insights of these research efforts, they will help students become better writers, which will benefit them in both academic and professional settings.

References


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Identifying the Needs of Opinion Leaders to Encourage Widespread Adoption of Water Conservation and Protection

Melissa R. Taylor1 & Alexa J. Lamm2

Abstract

Opinion leaders are persuasive in convincing others within their social networks to adopt certain opinions and behaviors. By identifying and using opinion leaders, agricultural educators may be able to leverage individuals who have influence on others’ opinions, thereby speeding up the adoption of new practices. In this article, we review a statewide survey to define opinion leaders and understand their current water conservation practices. Additionally, by using the theoretical framework of the diffusion of innovations, we explored what subject matter areas opinion leaders are most interested in, and where they go for more information. These findings will identify how agricultural educators can reach opinion leaders to help disseminate important water conservation information. The findings indicated opinion leaders have a good grasp on how to conserve water, but are still misusing water in terms of protecting its quality. Based on these findings it is suggested that agricultural educators develop educational programming focused on improving opinion leaders’ knowledge of water pollution; a connection needs to be made between water quality and the environment.

Keywords: opinion leaders, water conservation, water quality, extension, public opinion

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Introduction

Florida’s relationship with water has been historically complex. From early efforts to drain swamplands, to modern efforts to restore and conserve the natural environment, water defines the state (Baker & Behn, 2013). Over the years, residents have managed to drain, ditch, and divert so much water that there is not enough left in the ground for population growth, especially during times of drought (Barnett, 2007). Growth projections for Florida predict that over the next 30 years, demand for water in Florida will increase significantly due to a growing population (Sullivan, 2014). Groundwater over-pumping has led to emergencies in every region; South Florida suffers from saltwater intrusion, Central Florida is home to sinkholes and dried-up wells, and North Florida experiences bone-dry lakes (Barnett, 2007). The state has many water conservation initiatives in place, but there is still much that can be done to increase efficiency (Greene, 2010).

Florida has five water management districts established to manage regional water supply. Officials in four of Florida’s five-water management districts report they do not have enough water to supply projected population growth past the year 2025 (Barnett, 2007). To supply water to more

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than 90 percent of the population, Florida relies on groundwater pulled up from underground aquifers. Today, Florida residents are pumping water out of their aquifers faster than the state’s rainfall can refill them (Barnett, 2007). The state has concluded that additional demands for groundwater cannot be met without ecological damage to the aquifer (Overdevest & Christiansen, 2013). Repeatedly, opinion leaders in Florida’s agricultural sector have identified water as the top issue of concern (Odera, Lamm, Dukes, Irani, & Carter, 2013).

Opinion leaders are unofficial leaders with the ability to influence other’s decisions regarding the adoption of new products, practices, or ideas (Keller & Berry, 2003). In fact, in 1994 one opinion leader, Colonel Steve Monsees, convinced the Southwest Florida Water Management District’s board members that groundwater could not last (Barnett, 2007, p.108). Monsees blamed the county government on piping groundwater south for public supply. He pleaded “…all surface water is gone. All wetlands and marshes are gone. Most wildlife has disappeared. I [feel] violated and angry because of the loss of our lakes, ponds, wetlands, and wildlife. Please restore what is lawfully and rightfully ours” (Barnett, 2007, p. 108).

Opinion leaders tend to be persuasive in convincing others within their social networks to adopt certain opinions and behaviors (Keller & Berry, 2003). They tend to distribute information to their peers by upholding social norms. By identifying and using opinion leaders, agricultural educators may be able to leverage individuals who have influence on others’ opinions, thereby speeding up the adoption of new practices (Rogers, 2003).

Cialdini and Goldstein (2004) found when people are unsure of what to do they look toward others for guidance on how to act. Opinion leaders have the social power to influence potential early adopters. According to Rogers’ (2003) theory of diffusion, individuals fall into one of five categories when it comes to changing behavior: innovators, early adopters, early majority adopters, late major adopters, and laggards. Opinion leaders are often recognized as early adopters who actively seek out information to learn more about how behavioral change may influence their surroundings (Dalrymple, Shaw, & Brossard, 2013).

In this case, opinion leaders can serve as a vessel for communicating with the public about water related issues. They may be successful at persuading difficult-to-convince audiences, such as late adopters or laggards, to follow environmental policies and behaviors (Dalrymple et al., 2013). Opinion leaders may have the ability to encourage positive behaviors within social groups, while continuing to play a key role in the diffusion process.

To better understand how opinion leaders can inform the rest of the public, it is important to study the water issues of interest of opinion leaders. Sometimes opinion leaders will use what is referred to as informal learning, which may include interpersonal interaction, but at the very least opinion leaders stay up to date, are always willing to answer questions, and treat others as equals (Wadhwa, Ford-Jones, & Lingard, 2005). Water subject matter areas and methods of learning are largely under-identified for the opinion leader population. Opinion leaders can validate water issue practices and also facilitate the widespread adoption of suitable technologies (Wyckhuys & O’neil, 2007) therefore, it is important to further explore their needs to drive the development of effective programs. This research aligns with the American Association for Agricultural Education National Research Agenda (Roberts, Harder, & Brashears, 2016) because it was designed to be used by extension educators to enhance the development of programs targeting opinion leaders interested in water issues resulting in more effective programs.
Theoretical Framework

This research was based on the Theory of Diffusion of Innovation (Rogers, 2003). The theory is a social process explaining how information about a new idea is communicated and disseminated. As part of this theory, Rogers (2003) asserted that opinion leaders are more likely to be the first to participate in behaviors that could potentially influence their social networks. The dissemination of the new behavior occurs over time and can be seen as going through five distinct stages: persuasion, decision, implementation, and confirmation (Minisha-Majanja, 2005). Potential adopters must first learn about the innovation, be persuaded of the merits of the innovation, adopt it, implement it, and confirm the decision (Minisha-Majanja, 2005). Typically, early adopters are the initial group experimenting with innovations and new ideas and are usually comprised of opinion leaders (Rogers, 2003).

Early studies identified certain individuals who paid close attention to an issue, frequently discussed the issue, and considered themselves more persuasive in convincing others to adopt the opinion as opinion leaders (Katz & Lazerfield, 1955). These behaviors helped opinion leaders not only draw attention of others to a particular issue, but also, signal how others should respond to the issue (Nisbet & Kotcher, 2009). In this research we focused on issue-specific opinion leaders as identified by Katz and Lazerfield (1955). These leaders are involved with a specific issue or topic, in our case Florida water conservation efforts, characterized by greater levels of media attention and specific knowledge.

Water topics itself fall largely under climate issues. Survey trends depict the American public is still largely skeptical about climate issues (Bluc, McGarty, Thomas, Lala, Berndsen, & Misajon, 2015). In today’s media world, the American public has greater access to quality information about water disparities, yet public concern remains low and citizens remain demobilized (Nisbet & Kotcher, 2009). Following Dalrymple et al.’s study (2013), we want to explore the potential role that opinion leaders play in advocating behavioral compliance among water users, beyond the influence of mass communication campaigns. We are looking at outlets that motivate opinion leaders to participate in environmental outreach activities so as to influence others (Dalrymple et al., 2013).

Dalrymple et al. (2013) looked at the role opinion leaders played in informing the public about aquatic invasive species in the Wisconsin lakes. This research focused on an opinion leader’s internal efficacy (McCluskey, 2004). Individuals with high levels of self-efficacy are more motivated to seek out relevant information (Rimal, 2001) and influence behaviors. This study showed opinion leaders who have a strong sense of self-efficacy are important when encouraging behavior change (Dalrymple et al., 2013). Discovering opinion leaders interest in learning about water conservation will become even more important in increasing awareness of environmental issues and encouraging preventative behaviors.

Purpose and Objectives

The purpose of this study was to understand the types of water-conservation measures that opinion leaders show interest in and how they would like to learn about these practices. The results will help extension education develop programs that are interesting and engaging for opinion leaders. The research is guided by the following objectives:

1. Describe water issue opinion leaders within the general public in Florida.
2. Describe water conservation behaviors of opinion leaders.
3. Describe the organizations opinion leaders go to for information.
4. Identify the water issue subjects that opinion leaders are most interested in learning about.

5. Determine how opinion leaders want to receive information.

**Methods**

To reach the objectives of the study, an online survey was employed to residents of Florida aged 18 and older. The survey instrument included elements from several existing instruments including the Canadian water attitudes survey from the Royal Bank of Canada’s Blue Water Project (Patterson, 2012), the National Water Survey Needs Assessment Program (Mahler et al., 2013), and the Government Style Questionnaire (Green-Demer, Blanchard, Pelletier, & Beland, 1994). As part of a larger study, five sections of the instrument were relevant to this research study: the identification of water issue opinion leaders, their level of engagement in water conservation practices, the organizations they would go to for more information, the subject matter areas they were most interested in learning about, and how they would like to receive that information. Results were analyzed using the Statistical Package for Social Sciences (SPSS) version 22 and Microsoft Excel.

To identify water issue opinion leaders, respondents were given six statements and asked to select where on a five-point semantic differential scale between two phrases their attitude most closely aligned. A score of one represented a low level of opinion leadership represented by phrases such as “told no one”, “never”, “your friends tell you about water issues”, “give very little information”, “not at all likely to be asked”, and “not used as a source of advice.” A score of five represented a higher level of opinion leadership and was characterized by phrases such as “told a number of people”, “very often”, “you tell your friends about issues including new developments”, “give a great deal of information”, “very likely to be asked”, and “often used as a source of advice.” Results from the individual opinion leadership items were averaged to create an overall opinion leadership index score. Reliability of the opinion leadership scale was calculated ex post facto and resulted in a Cronbach alpha coefficient of .88.

To identify the opinion leaders within the larger population, z-scores were run on the opinion leadership index. Respondents scoring below a negative one were assigned a one, those scoring between zero and one were assigned a two, and those scoring a one or above were assigned a three. The respondents assigned a three were considered the water issue opinion leaders. The mean score for the general public was 2.48 (SD = .96). A respondent was considered an opinion leader if they were one standard deviation above the mean. The 134 respondents that fell into this category were used for further analysis.

The responses to the water conservation behavior engagement, subject matter areas of interest and learning preferences were analyzed descriptively.

To measure water conservation habits, respondents were asked to respond to a series of statements pertaining to water conservation practices on a five-point modified Likert scale ranging from 1 = Never, 2 = Almost never, 3 = Sometimes, 4 = Almost every time, and 5 = Every time. Example statements included: “I turn the water off every time I brush my teeth”, “I avoid watering my lawn in the summer”, “I let my sprinklers run when rain is predicted in the forecast”, and “I hose down my driveway.”

Next, respondents were asked to identify where they went for water issue related information in an open-ended format. Respondents were asked to list the top three agencies or organizations they would approach or consult with for advice about water issues. Respondents were...
then provided a list of water-related topics and asked to indicate which of the following subjects they would most like to learn about. Respondents could check all that applied.

Finally, respondents were asked their preferred methods for participation in learning about water topics. Respondents were given a list of topics they would most likely take advantage of if presented with the option. Again, respondents were allowed to check all that apply.

Prior to distribution, a panel of experts reviewed the survey instrument for face and content validity. The panel included the Associate Director of the [Center] at University of Florida, an Assistant Professor and Extension Specialist in Water Economics and Policy, the Director of Center for Public Issues and Education at University of Florida, and the Assistant Professor for the Center for Public Issues and Education at University of Florida.

As previously mentioned, the target audience included Florida’s general public’s residents’ aged 18 or older. Qualtrics, a third party public opinion research company, distributed the survey to their database of survey participants eligible based on a set criteria ensuring they were representative of the population of interest by sending a link to the survey. A 63% response rate was obtained (N = 749) from the 1,192 contacted. In order to ensure the respondents were representative of Florida’s population according to the 2010 U.S. Census, the data were weighted to balance their geographic location, age, gender, and race/ethnicity (Kalton & Flores-Cervantes, 2003). This is a common procedure in non-probability sample selections to balance for selection, exclusion, and non-participation biases (Baker et al., 2013).

To analyze the open-ended responses related to where respondents went for water issues information, the results were compiled into an Excel spreadsheet and then combined into categories including City/town/local (city of..., city, city council, mayor, city hall etc.), Water Agencies (includes water management, water department, water district), State Agencies (Government, DEP, State government, Fish and wildlife), County (County, county officials, county government), EPA (EPA, Environmental protection agency), and Non-profit groups (Water.org, Conserve Florida, Audubon, One Florida Foundation etc.). The number of responses within each category was tallied to describe where the respondents went for more information about water.

Results

Description of Water Opinion Leaders

The identified opinion leaders were more likely to be female (57.1%) compared to male (42.9%). Most, 71.3%, were Caucasian/White (Non/Hispanic). Twenty-eight percent were between the ages of 20-29. The opinion leaders reported their political affiliation to be Democrat (55.2%) and their political beliefs to be moderate (48%) and were primarily located in South Florida or the [county] Water Management District (67.8%). Additionally, 68.7 % were located in coastal counties of Florida.
Table 1

*Demographics of Identified Opinion Leaders (N = 134)*

<table>
<thead>
<tr>
<th>Category</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sex</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>76</td>
<td>57.1</td>
</tr>
<tr>
<td>Male</td>
<td>57</td>
<td>42.9</td>
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<tr>
<td><strong>Race</strong></td>
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<td></td>
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<tr>
<td>African American</td>
<td>34</td>
<td>25.7</td>
</tr>
<tr>
<td>Asian</td>
<td>3</td>
<td>2.5</td>
</tr>
<tr>
<td>Caucasian/White (Non–Hispanic)</td>
<td>95</td>
<td>71.3</td>
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<tr>
<td>Native American</td>
<td>1</td>
<td>3.0</td>
</tr>
<tr>
<td>Other</td>
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<td>3.2</td>
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<td><strong>Hispanic Ethnicity</strong></td>
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</tr>
<tr>
<td></td>
<td>43</td>
<td>32.1</td>
</tr>
<tr>
<td><strong>Age</strong></td>
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<tr>
<td>18-19</td>
<td>3</td>
<td>1.9</td>
</tr>
<tr>
<td>20-29</td>
<td>37</td>
<td>27.9</td>
</tr>
<tr>
<td>30-39</td>
<td>28</td>
<td>20.6</td>
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<td>40-49</td>
<td>26</td>
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<td>50-59</td>
<td>14</td>
<td>10.5</td>
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<tr>
<td>60-69</td>
<td>15</td>
<td>11.3</td>
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<tr>
<td>70-79</td>
<td>6</td>
<td>4.2</td>
</tr>
<tr>
<td>80 and older</td>
<td>6</td>
<td>4.2</td>
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<td><strong>Political Beliefs</strong></td>
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<tr>
<td>Very Liberal</td>
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<td>Liberal</td>
<td>24</td>
<td>18.0</td>
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<tr>
<td>Moderate</td>
<td>56</td>
<td>41.7</td>
</tr>
<tr>
<td>Conservative</td>
<td>24</td>
<td>18.1</td>
</tr>
<tr>
<td>Very Conservative</td>
<td>11</td>
<td>8.1</td>
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<tr>
<td><strong>Political Affiliations</strong></td>
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<td>Republican</td>
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<tr>
<td>Democrat</td>
<td>74</td>
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<td>Independent</td>
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<td>18.8</td>
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<tr>
<td>Non-affiliated</td>
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<td>8.8</td>
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<td><strong>Water Management Region</strong></td>
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<tr>
<td>South Florida WMD</td>
<td>44</td>
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<td>[County] WMD</td>
<td>45</td>
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<tr>
<td>Southwest Florida WMD</td>
<td>35</td>
<td>26.7</td>
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<tr>
<td>Northwest Florida WMD</td>
<td>6</td>
<td>4.5</td>
</tr>
<tr>
<td>[County] WMD</td>
<td>1</td>
<td>1.0</td>
</tr>
<tr>
<td><strong>Geography</strong></td>
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<tr>
<td>Coastal</td>
<td>91</td>
<td>68.7</td>
</tr>
<tr>
<td>Inland</td>
<td>40</td>
<td>30.5</td>
</tr>
</tbody>
</table>
Engagement in Water Conservation Behaviors

Engagement in water conservation behaviors was identified by requesting respondents identify their level of conservation efforts with a series of ten statements on a five-point Likert-type scale. Table 2 displays their behaviors. The highest reported habits included turning off the water while brushing teeth, avoiding allowing motor oil to run down a storm drain, and avoiding flushing cooking oil down the toilet. The items with the most equal distribution were not showering for more than five minutes each time they bathe and leaving the water running in the kitchen when washing and/or rinsing dishes.

Table 2

<table>
<thead>
<tr>
<th>Water Conservation Behaviors (N=134)</th>
<th>Never or Almost Never %</th>
<th>Sometimes %</th>
<th>Almost Every time or Every time %</th>
</tr>
</thead>
<tbody>
<tr>
<td>I turn off the water while brushing my teeth</td>
<td>7.2</td>
<td>13.5</td>
<td>77.5</td>
</tr>
<tr>
<td>I shower for no more than five minutes each time I bath</td>
<td>26.4</td>
<td>30.0</td>
<td>41.8</td>
</tr>
<tr>
<td>I avoid watering my lawn in the summer</td>
<td>7.3</td>
<td>37.1</td>
<td>36.7</td>
</tr>
<tr>
<td>I leave the water running in the kitchen when washing and/or rinsing dishes</td>
<td>49.8</td>
<td>25.6</td>
<td>22.1</td>
</tr>
<tr>
<td>I allow soapy water to run down a storm drain</td>
<td>68.7</td>
<td>7.7</td>
<td>14.3</td>
</tr>
<tr>
<td>I let my sprinklers run when rain is predicted in the forecast</td>
<td>55.6</td>
<td>8.1</td>
<td>12.0</td>
</tr>
<tr>
<td>I let my sprinklers run when it has rained or is raining</td>
<td>59.8</td>
<td>3.4</td>
<td>11.5</td>
</tr>
<tr>
<td>I hose down my driveway</td>
<td>57.3</td>
<td>23.2</td>
<td>10.3</td>
</tr>
<tr>
<td>I allow used motor oil to run down a storm drain</td>
<td>81.0</td>
<td>1.4</td>
<td>10.7</td>
</tr>
<tr>
<td>I flush cooking oil down the toilet</td>
<td>81.2</td>
<td>4.5</td>
<td>10.0</td>
</tr>
</tbody>
</table>

Note. Respondents were allowed to indicate if a statement did not apply, therefore percentages might not equal 100%.

Organizations Opinion Leaders Use for Information about Water

Respondents were asked an open-ended question about what organizations they would go to for more information about water issues. The most reported organizations from opinion leaders were water agencies, state agencies, non-profit/NGO groups, City/town/local organizations, or County organizations. Sixty-nine out of 134 respondents indicated they would turn to water agencies such as their local water department and their regional water management districts first. This was closely followed by 63 opinion leaders reporting they would go to state agencies such as the Department of Health, the Department of Agriculture, the Department of Environmental Health, the Fish and Wildlife Commission, and the State of Florida government for more information.
Forty-five opinion leaders reported going to non-profit groups such as Water.org, Conserve Florida, Audubon, and One Florida Foundation.

### Subject Matter Areas of Interest

Respondents were asked what water subjects they would be most interested in learning more about. Results are shown in Table 3. Respondents were asked to select all that apply. Of the options presented, opinion leaders were most interested in restoring fish and aquatic habitat, home and garden landscaping ideas for Florida yards, and fish and wildlife water needs.

<table>
<thead>
<tr>
<th>Subject Matter Area</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Restoring fish and aquatic habitat</td>
<td>23.2</td>
</tr>
<tr>
<td>Home and garden landscaping ideas for Florida yards</td>
<td>22.8</td>
</tr>
<tr>
<td>Fish and wildlife water needs</td>
<td>22.3</td>
</tr>
<tr>
<td>Watershed restoration</td>
<td>20.4</td>
</tr>
<tr>
<td>Shore-line clean up</td>
<td>20.0</td>
</tr>
<tr>
<td>Water policy and economics</td>
<td>19.5</td>
</tr>
<tr>
<td>Community actions concerning water issues</td>
<td>16.9</td>
</tr>
<tr>
<td>Fertilizer and pesticide management</td>
<td>16.0</td>
</tr>
<tr>
<td>Watershed management</td>
<td>15.5</td>
</tr>
<tr>
<td>Forest management and water issue</td>
<td>14.1</td>
</tr>
<tr>
<td>Irrigation management</td>
<td>12.3</td>
</tr>
<tr>
<td>Landscape buffers</td>
<td>12.2</td>
</tr>
<tr>
<td>Private well protection</td>
<td>11.6</td>
</tr>
<tr>
<td>Septic system management</td>
<td>6.9</td>
</tr>
<tr>
<td>Other</td>
<td>0.6</td>
</tr>
</tbody>
</table>

Additionally, respondents were asked how they would like to learn about water issues. The results are displayed in Table 4. Overall, opinion leaders would like to learn through visiting a website, watching TV coverage or a video, or reading printed fact sheets, bulletins, or brochures.
Table 4

*Opinion Leaders Preferred Modes of Learning (N = 134)*

<table>
<thead>
<tr>
<th>Opinion Leaders</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Visit a web-site</td>
<td>40.0</td>
</tr>
<tr>
<td>Watch TV coverage</td>
<td>34.5</td>
</tr>
<tr>
<td>Read printed fact sheets, bulletins, or brochures</td>
<td>24.9</td>
</tr>
<tr>
<td>Watch a video</td>
<td>24.9</td>
</tr>
<tr>
<td>Attend a fair or festival</td>
<td>22.4</td>
</tr>
<tr>
<td>Read a newspaper article or series</td>
<td>21.0</td>
</tr>
<tr>
<td>Take part in a one-time volunteer activity</td>
<td>15.3</td>
</tr>
<tr>
<td>Attend a short course or workshop</td>
<td>11.4</td>
</tr>
<tr>
<td>Get trained for a regular volunteer position</td>
<td>11.4</td>
</tr>
<tr>
<td>Look at a demonstration or display</td>
<td>11.9</td>
</tr>
<tr>
<td>Attend a seminar or conference</td>
<td>9.2</td>
</tr>
</tbody>
</table>

**Conclusions, Implications and Recommendations**

The results revealed self-reported water issues opinion leaders are predominately Caucasian and women. The largest age group identified within the opinion leaders were respondents aged 18 – 29, identified as a Democrat with moderate political beliefs. Additionally, opinion leaders were predominately from coastal communities and were a part of either the [County] or South Florida Water Management Districts.

Although self-designated survey scales are perhaps the least expensive and the easiest way for organizations to identify opinion leaders, the primary limitation is that respondents may overestimate or underestimate the actual degree of influence they have in their communication network (Nisbet & Kotcher, 2009). This being acknowledged, it is interesting to note many of the opinion leaders were younger compared to more seasoned residents. Previous research has shown younger individuals tend to be risk takers and more innovative in nature (Rogers, 2013) and therefore may be more engaged with taking action. Additionally, the majority came from east coast and southern coastal communities.

A downside to the majority of the opinion leaders being younger is that a younger audience is not turning to extension for information on water. This is significant to the industry. This information should encourage extension to design water-focused programming that can be marketed towards a younger audience. There are several recommendations suggested to help mitigate this issue.

It is proposed the reason opinion leaders represent a younger generation is that water conservation has become more of a pressing issue in the past decades than it was previously (Baker & Behn, 2013; Barnett, 2007). This might imply that the younger generation has more access to
mass media outlets such as social media or online news sources, which enables higher levels of opinion leadership compared to previous generations. As extension programs are developed around water issues, this should be kept at the forefront of planning to encourage the use of social media such as Facebook, Twitter, Instagram, etc., as a sharing platform.

Overall, the majority of opinion leaders engaged in water conservation behaviors by turning off the water every time they brush their teeth, not using sprinklers in advance of rain or after it has rained, and turning off the water when rinsing dishes and taking shorter showers. These results reveal that opinion leaders are cognizant of when they should be saving water. However, in terms of water quality conservation practices, the responses were different. While the majority responded positively to water conservation efforts, there is a portion still practicing wasteful water habits such as hosing down a driveway, allowing soapy water to fall down a storm drain, allowing used motor oil to fall down a storm drain, and flushing cooking oil down a toilet. This implies that even opinion leaders need continued exposure to understand why these particular habits are bad for the environment and should be addressed. Extension agents putting together water-focused programs should integrate educational experiences that stress the importance of protecting water resources in terms of water quality as well as conservation for water quantity.

As far as organizations available for more information, majority of respondents reported water management districts, state agencies and non-profit agencies as their top choices. The results revealed that opinion leaders are reaching out to non-profit groups over the Environmental Protection Agency or local city or county organizations. It can be concluded that opinion leaders are more knowledgeable of water issues and therefore know of different organizations besides public offices. Even more significant was the complete lack of mentioning the Land Grant University within the state as a resource, or the Cooperative Extension Service more specifically. This implies that Cooperative Extension has some work to do if they want to be a go to resource for those having the most influence within their communities when it comes to water issues. This finding shows that opinion leaders, those most active in disseminating water-related information, are not using extension agents as a resource. Readily addressing this gap is highly encouraged through further research identifying opinion leaders’ needs in this area and encouraging their use of extension materials.

Subject matter areas of particular interest to opinion leaders were restoring fish and aquatic habitats and fish and wildlife needs. The opinion leaders being predominantly from coastal communities may have played a role in this response and area of interest. This is a perfect example of the critical importance of protecting water resources in terms of water quality and water quantity. Extension agents have a role to play in educating this audience about how both efforts can have a positive effect on fish and wildlife habitat protection.

To learn more about these subject matter areas, opinion leaders would prefer to visit a website, watch TV coverage or a video, or read printed fact sheets bulletins or brochures. Traditionally, extension agents have focused on developing face-to-face interventions and educational opportunities, offering volunteer programs, and encouraging participation in workshops. Perhaps the development of short videos offered through an online medium that could catch the attention of opinion leaders in coast communities would be more effective. They would also be a medium easily shared by the younger generation through social media. Research examining the use of online resources and the amount of sharing that occurs as a result could further elucidate the time and effort it takes to create these materials. It is possible, that after engaging opinion leaders with informal learning techniques such as a website or video that face-to-face meetings could be set up to further interact with opinion leaders.
In order for any of the proposed actions to be successful, extension agents much motivate opinion leaders to promote the adoption of water conservation practices. Opinion leaders’ attitudes will impact the adoption of innovation. Additionally, extension agents must continue to work with opinion leaders to better understand how they are convincing others to adopt water conservation practices. As opinion leaders will be drawing attention to others of the issue at hand, it will be helpful to work with them to understand and establish goals of how to disseminate the information.

Water issues are not only rampant in Florida, but across the nation and are a nationwide priority for extension agents to address. This research identified water issues opinion leaders within Florida but additional studies could examine if individuals within other states have the same characteristics and needs. Perhaps a national extension campaign could be created targeting this important audience should trends emerge. Additionally, the use of opinion leaders in spreading extension information has been limited. This research revealed water issues opinion leaders are not using extension resources and do not identify the Cooperative Extension Service as a place to go for information. Future research could explore why opinion leaders do not identify it as a source of information to assist in overcoming this issue.

References


Professional Development Needs of Mid-Career Agriculture Teachers

Scott W. Smalley1 & Amy R. Smith2

Abstract

Nationwide, agricultural education faces a shortage of teachers (National Teach Ag Campaign, 2014; Foster, Lawver, & Smith, 2016). To remedy this, both recruitment and retention efforts are necessary. While extensive research in agricultural education has focused on needs of beginning teachers, less research has focused on needs of agriculture teachers at later career stages. As such, the purpose of this phenomenological qualitative study was to explore challenges, activities, and professional development needs of mid-career agriculture teachers, particularly those within the “Experimentation/Activism” and “Reassessment/Self-Doubt” stages identified by Huberman (1989). The study narrowly focused on a census of 35 teachers from across the country who applied for a professional development program designed for mid-career agriculture teachers. Mid-career teachers identified lack of time, course planning, and programmatic expectations as challenges or obstacles. The teachers reported a desire to fulfill professional development needs by networking, reenergizing, and improving stress management. Specifically, teachers reported participating in professional organizations, joining teacher listservs, and networking through the National Association of Agricultural Educators’ Communities of Practice for engagement and support. Findings suggest continued professional development offerings and additional research related to mid-career agriculture teacher well-being are warranted.

Keywords: mid-career, agriculture teachers, challenges, professional development, retention

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Introduction

Across the nation, school administrators, education leaders, and teacher educators have expressed concern regarding the ongoing teacher shortage. Since 2015, reports of teacher shortages have become more prevalent within the media (Daniel, 2015; Milliard, 2015; Sutcher, Darling-Hammond, & Carver-Thomas, 2016). Elaine Wynn, Nevada State Board of Education President described the teacher shortages as “horrific” and warned that without significant improvement “we’re going to all sink” (Milliard). Similarly, the former Texas Education Commissioner, Michael Williams, referred to the shortage as the “biggest threat” to education in Texas (Daniel).

National data on teacher supply and demand suggest continued challenges with shortages. Teacher demand remains on the rise; while, the number of new teachers is “atypically low” and

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declining according to a special report addressing teacher supply, demand, and shortages in the United States (Sutcher et al., 2016, p. 3). Additionally, teacher shortages can be further exacerbated by local, state, and national education policies. Shortages are often more profound in certain subject areas and experienced at a higher rate in urban, rural, high-poverty, high-minority, and low-achieving schools (Aragon, 2016). Unless major changes occur, annual teacher shortages could increase from 64,000 in 2016 to as many as 112,000 teachers in 2018 (Sutcher et al.).

Similar trends have been observed across many areas of career and technical education (CTE), as a significant gap exists between teacher supply and demand (Wilkin & Nwoke, 2011). Agricultural education is no different, suffering from a recognized shortage of teachers across the nation (National Teach Ag Campaign, 2014; Foster, Lawver, & Smith, 2016). Programmatic growth within school-based agricultural education contributes to this shortage, in part, with 175 new positions and 145 new programs reported in 2016 (Foster et al.). Additionally, less than 74% of license-eligible program graduates pursued school-based agricultural education teaching positions, while the remaining 26% of graduates pursued other career areas, military, or graduate school. Within agricultural education, several state and national efforts have been established to address this need, including but not limited to student loan forgiveness programs, upperclassmen scholarship programs, and the National Teach Ag Campaign’s State Teach Ag Results (STAR) program. Each of these efforts, and many others, are intended to increase the pipeline of prospective school-based agriculture teachers and contribute to greater retention in the profession.

Sutcher et al., (2016) suggest four main factors contribute to the teacher shortage across all fields of education: 1) a decline in teacher preparation enrollments, 2) district efforts to reduce student-teacher ratios, 3) increases in student enrollment, and 4) high teacher attrition. These factors support prior research by Conneely and Uy (2009) related to career and technical education. They suggested that the discontinuation of teacher education programs, an increase in student enrollment, and a large number of CTE teachers nearing retirement contributed to the crisis in CTE. “Student demand requires more teachers, but teachers are leaving the profession and the opportunities to cultivate new educators are limited as teacher programs are eliminated” (Conneely & Uy, p. 1).

Unfortunately, the answer to this shortage for agricultural education and all of education is not merely recruiting more teachers. Linda Darling-Hammond describes the teaching profession as a “leaky bucket”, citing more than 200,000 teachers leave the profession each year (Long, 2016). Ingersoll’s (2003) research suggested a majority of turnover occurs during the first five years on the job. Agricultural education research has echoed that sentiment, suggesting that beginning teachers are faced with many challenges and demands that contribute to the decision of leaving the profession (Myers, Dyer, & Washburn, 2005). Often mentoring and induction programs are designed to assist and support new and beginning teachers; however, they are not the only teachers who need assistance and support.

Teachers in all stages of their careers face professional challenges and have unique needs that must be met in order to be retained in the profession. With teacher attrition rates across the United States approaching 10% in the past decade, the Learning Policy Institute suggests that teacher retention, especially in hard-to-staff schools, could be improved through mentoring, induction, enhanced working conditions, and career development efforts (Sutcher et al., 2016).

State and national agricultural education leaders acknowledge the need for targeted professional development efforts, designed for school-based agriculture teachers at various career stages. Specifically, the National Association of Agricultural Educators (NAAE) developed a model, depicting the Ag Teacher’s Life Cycle (NAAE, 2015), which identifies key areas for professional development for early-career, mid-career, and late-career teachers. The primary focus
areas include teacher induction, work/life balance, community support, teacher leadership, and maintaining professional engagement and enthusiasm. These focus areas align with Sutcher et al., recommendations (2016) for increasing retention and minimizing teacher turnover.

Framework

A variety of models explain the career life-cycle of teachers, recognizing characteristics, challenges, and development needs within each stage (Fessler, 1985; Huberman, 1989; Steffy & Wolfe, 2001; NAAE, 2015). Each model suggests that to retain teachers and ensure a positive trajectory through the career life-cycle, opportunities for professional development and support for renewal must be provided. Research cites ways to increase teacher commitment to the school district and profession that includes: earlier and more challenging professional development, opportunities for leadership roles, and deeper dialogue with colleagues.

Huberman’s (1989) Teacher Career Cycle Model (see Figure 1) describes the stages as “Survival and Discovery” from 1-3 years, “Stabilization” from 4-6 years, “Experimentation/Activism” and “Reassessment/Self-Doubt” from 7-18 years, “Serenity/Relational Distance” and “Conservatism” from 19-30 years, and “Disengagement: Serene or Bitter” from 31-40 years.

<table>
<thead>
<tr>
<th>Years of Teaching</th>
<th>Themes / Phases</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-3</td>
<td>Career Entry: Survival and Discovery</td>
</tr>
<tr>
<td>4-6</td>
<td>Stabilization</td>
</tr>
<tr>
<td>7-18</td>
<td>Experimentation / Diversification</td>
</tr>
<tr>
<td>19-31</td>
<td>Stock-taking / Interrogations</td>
</tr>
<tr>
<td>31-40</td>
<td>Serenity</td>
</tr>
<tr>
<td></td>
<td>Conservatism</td>
</tr>
<tr>
<td></td>
<td>Disengagement (serene or bitter)</td>
</tr>
</tbody>
</table>

Figure 1. Michael Huberman’s (1989) Teacher Career Cycle Model

Huberman (1989) asserted the phases at mid-career are the most variable and extensive. In the fourth phase, teachers engage in self-questioning and may consider a career change. Further, Huberman discovered that teachers tend to associate three things with their most satisfying experiences in mid-career: 1) a role shift, 2) strong rapport with special classes or groups of students, or 3) significant results.
Similarly, Steffy and Wolfe’s (2001) model is rooted in transformative learning and emphasizes the importance of the reflection-renewal-growth cycle. This model also suggests the value of self-questioning resulting in positive answers. Specifically, they offer the following:

… The Life Cycle Model is an application on Mezirow’s transformation theory. As teachers progress throughout their careers, they can engage in transformational processes including critical reflection on practice, redefinition of assumptions and beliefs, and enhanced self-worth. Or they can disengage from the work environment as a source and stimulation for new learning and begin the gradual decline into professional withdrawal (Steffy & Wolfe, p. 17).

Until recently, many professional development programs in agricultural education focused on early career teachers. State mentoring or induction programs, regional “new teacher” workshops, and the NAAE Teacher Turn the Key program provide excellent resources and support for beginning agriculture teachers. However, there appears to be a lack of professional development designed for mid-career agricultural education teachers. In 2013, NAAE developed the eXcellence in Leadership for Retention (XLR8) program to meet the needs of mid-career teachers, specifically those with 7 to 15 years of teaching experience. The program was established to meet the following goals: 1) to develop teacher leaders who will mentor other teachers in the profession, 2) provide mid-career level specific professional development to participants, and 3) increase overall longevity and satisfaction of participants with their chosen career of teaching agriculture. The XLR8 program included participation in an intensive professional development experience (multiple sessions) during the NAAE convention, recurring virtual learning experiences, and online collaboration using the NAAE professional learning community, Communities of Practice, as well as other social media tools (NAAE, n.d.). Research regarding this initiative will better enable state and national leaders to identify and meet professional development needs of agricultural educators in this particular stage of the career cycle model, a priority expressed in the American Association of Agricultural Education (AAAE) National Research Agenda (Roberts, Harder, & Brashears, 2016).

**Purpose/Objectives**

The purpose of this phenomenological qualitative study was to explore self-reported challenges, activities, and professional development needs of mid-career agricultural educators, particularly those within the “Experimentation/Activism” and “Reassessment/Self-Doubt” stages identified by Huberman (1989). Specifically, three research questions guided this study:

1. What are the biggest obstacles that prevent mid-career agricultural educators from becoming the teachers they wish to be?
2. How do mid-career agricultural educators stay professionally engaged and up-to-date in teaching techniques and technical content?
3. What goals or objectives do applicants wish to achieve from a targeted mid-career professional development experience?

**Methodology**

The population included 35 agricultural educators with 7 to 15 years of teaching experience. Each had applied to participate in the 2014 eXcellence in Leadership for Retention professional development program, offered by the National Association of Agricultural Educators (NAAE). NAAE provided the frame for the study, as well as access to the written materials submitted by each applicant. To maintain confidentiality, all personal identifiers were removed.
A basic qualitative approach was utilized for this study as defined by Merriam (2009). Merriam contended that basic qualitative studies are the “most common form of qualitative research found in education” (p. 23). This study was a phenomenological study of mid-career teachers applying to participate in the XLR8 program. The application, submitted by individuals for consideration, was the source of information for this study. To promote trustworthiness of results, the researchers employed established qualitative research practices. In this study, the researchers used dialogue and written statements to identify and articulate potential biases and assumptions related to the research (Merriam) and determined it was appropriate to move forward with the examination of this particular topic. To acknowledge potential biases, the researchers were previously school-based agriculture teachers who are now employed as agricultural teacher educators. Credibility was enhanced through peer debriefings and independent coder review throughout the study (Guba & Lincoln, 1989). To answer the three guiding research questions, written materials for each of the 35 applicants were analyzed through content analysis techniques to identify themes. Particularly, participants’ responses to three open-ended questions on the program application were utilized. The three questions included:

1. What are the biggest obstacles that prevent mid-career agricultural educators from becoming the teachers they wish to be?
2. How do mid-career agricultural educators stay professionally engaged and up-to-date in teaching techniques and technical content?
3. What goals or objectives do applicants wish to achieve from a targeted mid-career professional development experience?

As applications were reviewed and transcribed, responses were open-coded, creating a master list of codes (Merriam, 2009). Codes were then grouped using axial coding and categorized systematically, guided by the study’s purpose (Merriam). Application transcriptions were re-read and categories refined, revised, and consolidated as analysis continued. Finally, primary categories or themes were named. The findings were cautiously analyzed and statements were contemplated before being subjected in the final draft. Trustworthiness and reliability of data were established through a research log, peer review of data analysis, and member checks.

Creswell (1998, p. 15) described qualitative research as “an inquiry process of understanding based on distinct methodological traditions of inquiry that explores a social or human problem.” This study was analyzed using content analysis to better understand challenges, activities and professional development needs of mid-career agricultural educators.

Findings

Of the 35 mid-career agriculture teachers who applied to the XLR8 program, the majority of applicants were female (n=23). Applicants represented all NAAE regions, with eight applicants from Region I, four from Region II, 10 from Region III, seven from Region IV, two from Region V, and four from Region VI. Twenty of the applicants were from multi-teacher programs, and the remaining 15 were in single-teacher programs. As a result of qualitative analysis, primary themes emerged from responses to each of the questions posed to applicants.

Mid-career agricultural educators in the study identified the biggest obstacle preventing them from becoming the teachers they wish to be was a lack of time or time management challenges. In fact, 19 of 35 applicants indicated time as a concern. Five additional applicants noted work/life balance concerns, which relates to time management and the challenge of balancing personal and professional responsibilities. One teacher described,
I want to be a great teacher, a great husband, and a great dad. It’s extremely hard to be really good at all three of these at once. It always seems that some part is usually neglected in some form at some time. ...there’s so much that is asked of teachers today that wasn’t required ten years ago.

Another stated, “Online lesson plans, response to intervention, faculty meetings, professional learning communities, and other innovations in education are always demanding more time of teachers.” Another explained, “I have found that there is not enough time to refine, design and improve class lessons and learning activities as regularly as I believe they should be.” Yet another shared, “Balancing family, FFA, classroom duties, advisor responsibilities, practice- not to mention staff meetings, progress reports, grades, IEP meetings, etc. There’s so much more to being a teacher than just teaching.”

A secondary theme, specifically noted by eight applicants, related to obstacles for mid-career agriculture teachers included course planning, particularly with regards to content knowledge, locating curriculum and classroom resources, and developing lesson plans. Specifically, three teachers noted a fear of failing students, themselves, or maintaining excellence in their programs.

One question asked mid-career agricultural educators how they remain professionally engaged and up-to-date in teaching techniques and technical content.

Applicants identified many means of “staying professionally prepared and up-to-date.” Participation in professional organization activities, participating in teacher listservs, and networking through NAAE Communities of Practice was the most identified theme in this area, which was reported by 29 applicants. One applicant offered, “Conferences have allowed me to meet other educators, learn from their experiences and take that new knowledge back to my own classroom, so my students benefit from them as well.” Another shared that “staying involved professionally has helped me become a better teacher.”

Numerous applicants noted specific professional development, offered at the school district, state, regional or national level that was particularly beneficial. Several state association conferences, regional NAAE conferences, and NAAE annual conferences were noted, in addition to Curriculum for Agricultural Science Teachers (CASE) institutes. One teacher noted, “I am constantly involved in trainings to fuel improvement in my abilities.” Others mentioned business and industry involvement and reading professional magazines as beneficial ways of staying professionally prepared.

These mid-career teachers were applying to participate in the inaugural XLR8 program, and each specified personalized goals for the outcome of the program. When asked what they “wanted to take away from the professional development experience” networking, becoming reenergized, and better handling stress emerged as primary themes. One teacher described a need for “exposure to effective, proven methods of helping a professional deal with stress, increased workloads, and balancing.” Another openly shared, “I would like to reenergize myself and rediscover the reason I became a teacher. I want the excitement I had when I was first starting out.”

Additional themes specifically noted by three applicants included being motivated to overcome obstacles and being able to handle stress. Additionally, applicants stated they wanted to come away from the training with ways to better develop their personal and professional life balance.
Conclusions/Recommendations

This study was a census of 35 mid-career agriculture teachers, designed to explore self-reported challenges, activities and professional development needs. The intent was not to generalize the results to all mid-career agriculture teachers, but rather to describe the population of mid-career teachers who self-selected to apply for targeted professional development through the XLR8 program. Caution should be taken to not generalize the results to broader populations.

Based upon the themes identified through examination of data provided on applications completed by the mid-career teachers, the following conclusions are offered. Overall, this group of mid-career agriculture teachers was interested in personal and professional development opportunities offered, which may differ from teachers at other career stages. Specifically, mid-career challenges with time management, work/life balance, and course/lesson preparation were frequently mentioned. Teachers in this group expressed a desire for connections, collaboration, and support. NAAE’s Ag Teacher’s Life Cycle model (NAAE, 2015) acknowledges this as a professional development need for teachers in this career stage. Additionally, these findings are consistent with recent research, by Sorensen and McKim (2014), that suggested that mid-career agriculture teachers (6 to 19 years of teaching experience) in Oregon were identified as having the lowest work/life balance and lowest professional commitment.

Despite having survived the initial years in the profession, perhaps these mid-career teachers experience unique pressures as a result of their role in leading established programs that require a significant amount of time and energy. Many applicants noted the importance of professional development to career success and expressed a desire for help balancing work and family lives. As one applicant offered, “I want to be a great teacher, a great husband, and a great dad.” This desire to succeed in all aspects of life, professionally and personally, may require additional support in order to retain agriculture teachers into the later stages of the career life-cycle. This aligns with recommendations from Huberman’s (1989) research that mid-career teachers’ most satisfying experiences often relate to role shifts, strong rapport with classes and students, significant successes, or results. How might intentional professional development for mid-career agriculture teachers account for this?

In summary, a lack of time, course planning, and programmatic expectations were identified as challenges or obstacles for mid-career agriculture teachers in this study. Teachers indicated they participated in professional organizations, joined teacher listervs, and networked through NAAE Communities of Practice for engagement and support. Further, they reported a desire to fulfill professional development needs by networking, reenergizing, and improving stress management. While these findings are insightful, perhaps solidifying current beliefs held by agriculture teachers, additional research is necessary. Agricultural education leaders should conduct research on mid-career agriculture teachers, much like the extensive research on pre-service and early-career teachers. Further research initiatives should be developed to determine if similar themes emerge with larger, more diverse, groups of mid-career agriculture teachers. Longitudinal data should be collected from professional development program participants, such as those completing XLR8, so that evaluative studies can determine if participants’ needs were met, and assess the overall impact of the programming.

Despite the need for additional research in this area, recommendations for practice can be made. Building upon the model of mentoring and induction often utilized for beginning teachers, enhanced mentoring would be beneficial for mid-career agriculture teachers. Relevant and timely professional development offered by state and national agricultural education organizations, could help minimize challenges and obstacles faced by mid-career agriculture teachers and result in a
more positive outlook or perspective regarding working conditions and expectations of profession. Additionally, targeted professional development for teachers at other career stages should be developed as well.

**References**


Experiences of Agricultural Education Preservice Teachers Engaging in Critical Friendships

Sable Sellick¹, Catherine W. Shoulders², Donald M. Johnson³ & H. L. Goodwin⁴

Abstract

As teachers search for ways to improve their craft through reflection, critical friendships have proven to be effective at improving preservice and inservice teachers’ reflective behaviors. This qualitative study sought to understand the experiences of agricultural education preservice teachers participating in critical friendships with other agricultural education majors and with teachers in other disciplines. After three weeks of engaging in critical friendships, analysis of discussions between critical friends and interviews with participants indicated that, while the critical friendships were perceived as helpful, their utility was dependent on specific conditions within the teachers’ settings. Additionally, preservice agriculture teachers engaged in different types of discussions when working with peers within or outside the discipline. The findings and implications from this study can assist teacher educators in developing parameters for critical friendships that can ensure their effective use and success within agricultural education.

Keywords: critical friendships, reflection, preservice teachers

Introduction

In their quest to discover what makes an effective teacher, Cruickshank and Haefele (2001) found that the answer is not so simple. They posited that, among many other qualifiers, effective teachers possess a “strong, sustained interest in learning about the art and science of teaching and about themselves as teachers” (p. 28). Specific to agricultural education, the American Association for Agricultural Education (Doerfert, 2011) stated that educators with “adaptive expertise” (p. 22) were best suited to teach today’s students.

There are multitudes of ways in which educators can hone their expertise in adaptation, one of which is the practice of reflection. Dewey (1933) defined reflective thought as the process of examining the basis of one’s beliefs and declared the reflective process to be the most effective method of improving one’s self. Methods and types of self-reflection used in agricultural education teacher training have been examined in several studies (Epler, Drape, Broyles, & Rudd, 2013; Greiman & Covington, 2007; Lambert, Sorenson, & Elliot, 2014), exploring topics ranging from the transfer of specific teaching skills and using reflection to understand the student teaching experience to determining differences in depth and content of reflection based on methods of reflection and discovering student teachers’ preferred methods of reflection. However, as self-examination often excludes outside viewpoints (Valli, 1997), the reflector may have difficulty

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evaluating the effectiveness of his or her actions (Webb, 2000). Another avenue of educator
development involves a trusted individual, or critical friend, who provides supportive feedback
and, as Costa and Kallick (1993) described, “nudges the learner to see the project from different
perspectives” (p. 50). The critical friend facilitates reflection by helping the educator visualize a
situation from a different view (Swaffield, 2007). However, the use of critical friendships has not
yet been examined in the context of agricultural education teacher preparation. The proven benefits
of critical friendships in other educational contexts (Baskerville & Goldblatt, 2009; Farrell, 1998;
Golby & Appleby, 1995; Petrarca & Bullock, 2014; Schuck & Russell, 2005) suggest potential for
improving the reflective experiences of agricultural education preservice teachers.

Agricultural education students are often able to form tight-knit bonds with their
intradisciplinary peers; however, their network of teaching cohorts expands greatly during their
teaching experience. Differences in the professional identities and values of agricultural education
preservice teachers and preservice teachers of other subjects (Parr & Aldridge, 2016; Shoulders &
Myers, 2011) may prevent agricultural education preservice teachers from actively pursuing
professional relationships with preservice teachers in other disciplines. Agriculture teachers have a
known history of loyalty toward one another, with researchers noting their tendency to “stick
together” over three decades ago (McCracken & Etuk, 1985, p. 6). Shoulders and Myers (2011)
suggested this loyalty implies a shared professional identity among agriculture teachers.
Essentially, agricultural education teachers adhere to the homophily principle: strong bonds are
formed with little effort between similar individuals (McPherson, Smith-Lovin, & Cook, 2001). The
list below details the characteristics that distinguish agricultural education from other
education disciplines, leading to a unique professional identity among agriculture teachers:

1. Agricultural education majors have displayed a stronger orientation toward the subject of
agriculture (Parr & Aldridge, 2016), while elementary teachers have been reported to be
more child-oriented (Richardson, 1996).
2. In most teacher preparation institutions, agricultural education preservice teachers are
enrolled in programs housed within colleges of agriculture, while other preservice teachers
are enrolled together in programs housed within colleges of education (Knebel, 1977; Parr
& Aldridge, 2016).
3. Agricultural education has historically been a male-dominated profession (Camp, Broyles,
& Skelton, 2002; Kelsey, 2006), while most other teaching disciplines have historically
been female-dominated (Paechter & Head, 1996; Shoulders & Myers, 2011; Skelton,
2003).
4. The traditionally production-oriented focus of agricultural education, paired with
educational reforms that focus on the STEM and critical thinking skills, may cause
agriculture teachers to perceive “a gap between their disciplinary culture and new social
demands” (Simonneaus, 2000; p. 28).
5. Societal beliefs about the prominent and diverse roles of the agriculture program (Terry &
Briers, 2010) give the agriculture teacher a perceived degree of informal power and
leadership unavailable to teachers of other disciplines (Paechter & Head, 1996).

While agriculture teachers may perceive their professional identity as markedly different
from that of teachers in other subjects, they still work alongside teachers in other disciplines in their
schools. At least half of the nation’s high school agriculture programs employ one agriculture
teacher (Smith, Lawver, & Foster, 2017), suggesting that a considerable number of teachers must
rely on collaborative relationships with teachers from other disciplines for within-school
collaboration. Participation in critical friendships may allow agriculture teachers to form bonds
over shared struggles and problems with peers in their discipline and in other disciplines; however,
little is known about how homophily within teacher professional identity shapes their critical friendship discourse.

**Conceptual Framework**

Critical friendship is both an extension and an essential part of peer observation, as it involves peers observing one another and reflecting together in person, over the phone, or through written correspondence. Achinstein and Meyer (1997) defined it as a process that engage peers “in critical reflection in the climate of friendship” (p. 4). Critical friendships emphasize trust between participants (Farrell, 1998; Handal, 1999), which allows for a clearer and more honest discussion of the teaching process (Costa & Kallick, 1993; Franzak, 2002). Critical friendships are based on the exchange of constructive criticism, meant to be supportive of the person being criticized, to advance the development of the involved parties as educators and encourage them to carefully examine their methods and the beliefs that underlie those methods (Özek, Edgren, & Jandér, 2012). A critical friend assists by “hold(ing) up a mirror to another person in terms of their practice or ideas so that they can examine them critically” (Swaffield, 2007, p. 209).

Most critical friendships have been found to be positive experiences which allowed the participants to develop trust in each other and improve educational practice (Baskerville & Goldblatt, 2009; Farrell, 2001; Flessner & Horwitz, 2012; Manouchehri, 2002; Peel & Shortland, 2004). Swaffield (2008) agreed that trust was essential to the success of a critical friendship, and added that dialogue, or “the exchange of ideas and the search for shared meaning and common understanding” (p. 328), was an additional core feature of critical friendship. Petrarca and Bullock (2014) came to a similar conclusion, stating that participating in a critical friendship helped them find “support and reassurance” (p. 277) in each other as they realized that they were struggling with similar problems. However, Golby and Appleby (1995) cautioned that differences in the levels of experience between participants may inhibit the formation of a truly equal partnership. Schuck and Russell (2005) suggested that entering into a critical friendship with an individual who is already a friend may make the process easier at first, but did not guarantee that the partnership will be successful over time. Although critical friendships among experienced educators typically developed from a need for informal feedback on teaching effectiveness (Farrell, 2001; Petrarca & Bullock, 2014; Schuck & Russell, 2005), critical friendships among preservice teachers tended to form only if it was required as a part of the teacher preparation program (Franzak, 2002) or if they were participating in a research study (Manouchehri, 2002). Especially important was the stipulation that participants in critical friendships be given the choice to pick their critical friend, as Farrell (1998) postulated that choice of a “partner who is already known and familiar” (p. 85) could shorten the time needed to develop trust in the relationship.

The literature suggests critical friendships could be a promising method to encourage reflection in early practitioners. Terry and Briers (2010) encouraged agriculture teachers to build relationships with colleagues in their schools and with peers in the agricultural education profession both state- and nation-wide. However, Shoulders and Myers (2011) suggested that agriculture teachers have a unique professional identity which differs from the professional identity of educators in other subject areas, which may cause challenges in the formation of effective critical friendships between agriculture teachers and colleagues within their schools. An examination into how preservice agriculture teachers are able to establish and use critical friendships within and outside of the discipline can assist the profession in utilizing critical friendships in ways that improve self and peer reflection, and in turn, teaching behaviors.

**Purpose and Research Questions**
The purpose of this study was to understand the experiences of agricultural education preservice teachers participating in critical friendships with other agricultural education majors and with teachers in other disciplines. The following research questions guided the study:

1. What are the experiences of agricultural education preservice teachers in critical friendships with other agricultural education majors?
2. What are the experiences of agricultural education preservice teachers in critical friendships with education majors in disciplines outside of agricultural education?

Methods

The day-to-day conversations between teachers influence their future actions, but the connection between the two is taken for granted, and therefore remains largely unnoticed. Further hidden within this mundane discourse is the ways in which teachers decide who they talk to, and which conversations influence their actions more or less heavily. Therefore, this study utilized a phenomenological approach to examine teacher-to-teacher conversation to understand how agricultural education students interpret and react to feedback from critical friends within and outside of the agricultural discipline (Shutz, 1967).

A complete sample (Flick, 2006) of all agricultural education preservice teachers participating in a student teaching internship at the University of Arkansas in the Spring 2016 semester was used ($N = 6$). Five of the six agreed to participate in the study. The participants included four females and one male, all in their early 20s. Following a thorough briefing on the subject of critical friendships during a one-hour training session, participants were randomly assigned to one of two groups. Three participants were randomly assigned to select a critical friend in the agricultural education discipline. The critical friend could be a preservice teacher, a recent graduate of the program, or a current agricultural education teacher with two years of teaching experience or less. The remaining participants ($n = 2$) were required to choose a critical friend in an education discipline outside of agricultural education. The critical friend in this instance could also be participating in a student teaching experience during the same timeframe, a recent graduate of a teacher preparation program, or a current teacher with two years of teaching experience or less. The literature indicated that having a critical friend with a similar level of experience was most effective, as Schuck and Russell (2005) and Golby and Appleby (1995) suggested that critical friends with different levels of experience might hesitate to offer critique.

For the first three weeks of the student teaching period, all participants were required to conduct a weekly discussion with their critical friends and complete a post-conversation critical friendship-focused journal entry, adapted from a critical reflection worksheet developed by Baskerville and Goldblatt (2009). The journal entry served as a motivator and guide for students during their conversations – they were told the conversations were a means of gathering content for their journal entries, with the intention of increasing their motivation for engaging in the conversations regularly and in a timely fashion. Content and face validity were confirmed by an expert in teacher education. The journal also included guidelines and frequently asked questions about the characteristics of critical friendships and participation requirements. To help the participants get started, some prompting questions for critical friendship conversations were also included. The participants recorded their conversations from weeks four through six; conversations from the first three weeks were not recorded so participants could become comfortable talking with their critical friend.

In addition, participants were required to engage in a peer observation exercise with their critical friend during the three-week data collection period. To control variability within the peer observation process, a 30-minute lesson plan informing high school students about higher education
opportunities was developed. The lesson plan was reviewed by a panel of experts in agricultural education for face and content validity. The participant-critical friend dyads were required to participate in a pre-observation meeting to achieve an understanding of the school and classroom context, and in a post-observation meeting to collaboratively reflect on the experience, as per the protocol for previous studies using peer observation (Cosh, 1999; Kohut, Burnap, & Yon, 2007). Following the completion of the lesson, participants completed a written journal entry and then discussed the reflections with their critical friend. Near the end of the student teaching experience, semi-structured one-on-one interviews about having a critical friend and serving as a critical friend were conducted with participants using a protocol adapted from Dahlgren et al. (2006). The 30-minute interviews were conducted via voice recorded phone calls over the course of the last two weeks of the participants’ student teaching experiences. Interview questions addressed participants’ perceived teaching styles, changes in their teaching they may have made as a result of participation in the critical friendship, and their perceptions of risks and benefits of engaging in critical friendships.

Data were collected via participant-critical friend conversations and through one-on-one semistructured interviews conducted and recorded by the researcher. Participants were instructed to download a call-recording app to their phones and use it to record their conversations with their critical friend. Each participant was assigned a Google Drive folder, where audio files were to be saved and uploaded following each conversation.

The interviews and recorded conversations between critical friends were transcribed verbatim using ExpressScribe and coded for themes using the constant comparative method (Glaser, 1965). In this method of analysis, the researcher sorts incidents in the data into categories, first comparing the incidents with other incidents in the same category as they are coded, and then comparing the incidents in a category with the properties of the category (Glaser, 1965). As the limits of the developing theory become clearer, the researcher focuses on achieving theoretical saturation in the coding categories; at the end of the process, the researcher uses the data to formulate a theory (Glaser, 1965). Journal entries were collected and served as a means for triangulation, but were not analyzed separately, as they contained students’ summaries of the conversations already being analyzed.

Rigor of the study was ensured through use of Lincoln and Guba’s (1985) techniques for evaluating qualitative research, including establishment of credibility, transferability, dependability, and confirmability. Credibility was established through triangulation of sources, as data was collected weekly for the duration of the study and again at the end of the study. Data was also triangulated through the collection of the critical friendship journals (Patton, 1999). At times when researchers were either individually unclear or collectively in disagreement on the meaning or intent of data from the recorded conversations, written journal entries were referenced to establish and confirm the participant’s meaning or intent. Peer debriefing was also used to discover researcher-oriented assumptions and determine the suitability of the methods used in the study (Lincoln & Guba, 1985). Transferability was established using thick description of the participants’ experiences in critical friendships and how they fit in the context of the existing literature (Holloway, 1997). Dependability was established via an inquiry audit performed by an expert in teacher education. The expert examined the research process and the findings, and prompted us to reexamine the data and revise themes. This inquiry audit was made feasible by an audit trail, which also established confirmability (Lincoln & Guba, 1985). Following Halpern’s (1983) recommendations for developing an audit trail, the design process was recorded in a researcher notebook in order to illuminate the process by which final design decisions were made. We kept all raw data including participant recordings, interview recordings, and journal entries. Transcriptions were verbatim and were checked against the raw data to confirm accuracy. All notes
and coded copies of transcriptions were reviewed by the researchers to confirm connections between themes and the data.

In order to foster reflexivity within the study’s design, data collection, and analysis, the researchers developed a reflexivity statement. This statement was constructed prior to the study’s design and reviewed and revisited by all researchers throughout the research process. Additionally, an expert in social science research but outside the teacher education program was included in the research process to provide additional accountability for recognition of preconceptions (Cohen & Crabtree, 2006).

Each of the researchers is responsible for instruction at the University of Arkansas and share office space within the same building; these circumstances have led the researchers to engage in informal critical friendships with one another in the past. All are certified to teach high school agricultural education. The lead researcher is a graduate student in the Agricultural Education program, and graduated from the University of Arkansas with a degree in agricultural education. One of the researchers is responsible for agriculture teacher education, one is responsible for teaching some of the elective courses undergraduate and graduate students within the major may take, and one is responsible for teaching courses within agricultural business and law. Through these roles, three of the four researchers have interacted with the participants before this study. Each of the researchers holds value in constructive criticism from others, and perceives that it is this concept which forms the very foundation of critical friendships. We believe there are prime learning opportunities to be found within positive and negative teaching experiences, and that these are enhanced through open discussion and reflection with peers. However, we recognize that these perspectives are not held by all teachers, and believe that teaching experiences can increase the value one holds in critical friendships.

Findings

Of the five participants from the Spring 2016 student teaching cohort, three chose to complete the entire study. One preservice teacher dropped out of the group assigned to selecting critical friends outside the discipline, while one dropped out of the group assigned to select a critical friend within agricultural education. Two of the student teachers within the homogeneous dyad were placed at the same school and served as each other’s critical friend, and the third participant selected a critical friend outside of agricultural education as requested. Different main and sub-themes emerged from the critical friendship conversations, depending on whether the critical friendship was between two agricultural education preservice teachers or between an agricultural education preservice teacher and an early-career teacher in another discipline. This was not the case for the interview data, where the same two themes were seen in the interviews of participants in both types of critical friendships.

Agricultural Education Critical Friend Conversations

Four main themes emerged from the conversations between Participant 1 (P1) and Participant 3 (P3), the two participants in the agricultural education—agricultural education critical friendship: concern about dealing with the uncooperative minority of students; discussion of potential solutions; openness to feedback; and uncertainty about problems and solutions.

Concern about dealing with the uncooperative minority of students. Throughout their conversations, the agricultural education-agricultural education critical friend pair began by describing a specific problem related to teaching practice that one of the two had experienced, such as “five of [the students] are just—they don’t pay attention, they don’t wanna do what I ask them
to do” (P1-P3 conversations, p. 1 lines 3-4), and “most of my class does really well, but I have a handful of students that want to sit on their phone, constantly, no matter what, no matter how many times I ask them to get off” (P1-P3 conversations, p. 3 lines 18-19). Nearly every teaching problem described by the participants involved just a few students and usually involved a lack of motivation, engagement, or attentiveness. In describing a problem they had with several students, P3 reflected on the details of the situation:

P3-sigh-There's only like, f--there's three kids that I don't think that they're learning anything, because half the time, they're just looking off into space....but, I can't test that ability.

P1-Mmhmm.

P3-I mean, they turn their worksheet in like they're supposed to...well, one of them doesn't, but most of them--they, the other two do, and I just, I guess I don't know...where to go....(P1-P3 conversations, p. 9 lines 22-26)

Discussion of potential solutions. After listening to their partner’s teaching concerns, the critical friend usually tried to seek additional understanding of the problem by asking a clarifying question. Regarding P3’s five problem students, P1 asked if there were “one or two that like, kind of egg it on, that really start up” (P1-P3 conversations, p. 1 lines 11-12). P1 then used this information to recommend a solution that they had used themselves. After P1 described their problem with cell phones later in the conversation, P3 asked “do you give them daily participation points?” (P1-P3 conversations, p. 5 line 3), and proceeded to recommend implementing a three strike rule, where every strike is a grade deduction (P1-P3 conversations, p. 5 lines 16-17). The proposed solution was usually presented via a detailed description of an experience where the critical friend had successfully implemented the technique. This description might also include relevant details about the situation it was used in, and a description of how the students reacted to the implementation of the technique. P1 demonstrated this theme while presenting another option for handling P3’s problem students:

Oh my goodness, [student] was giving me so much...trouble, and whenever I pulled him out of class... and, er, class was over and I asked him to stay back, and I just talked to him for a few seconds. I was like "Hey...dogging [sic] on you hour--all hour is not what I want to do, it's hard on me, it's hard on you, it's annoying, it wears me out...I just need you to do your work. This is my job, and I'm your teacher, that's all I'm doing. I'm not trying to pick on you, I just want you to get your work done. He's like...."Yeah, I understand, I don't know why I was being like that," and honestly, I haven't had much of a problem since... (P1-P3 conversations, p. 2, lines 16-24).

Openness to feedback. The participants were accepting of the constructive criticism offered by their critical friend, especially if the feedback they received fit in the established classroom culture. P1 liked P3’s suggestion of a three strike rule, stating that they were “going to try that...the basket thing and the three strike” (P1-P3 conversations, p. 7 line 16), and P3 said they would “take all suggestions for eighth grade now” (P1-P3 conversations, p. 7 line 17). Participants often verbally indicated that the suggested solution might be something they would attempt to implement in their classroom.

Uncertainty about problems and solutions. There were a few teaching problems for which neither participant had an effective solution, and doubts were expressed about the ability to
change. In discussing their teaching issues, the participants expressed uncertainty about how to proceed and doubt about the solutions they had already attempted to implement and about their ability to change themselves or their students. The description of the teaching problem was usually followed by an admission of lacking knowledge of how to handle that particular situation. P3 admitted that “I don’t know, I’m just...struggling with, should I keep stuff in my classroom the same, or should I change it?” (P1-P3 conversations, p. 9, lines 7-8), and P1 stated that “I just don’t know how to not keep harping on those few students while the rest of them are doing fine” (P1-P3 conversations, p. 3, lines 25-26).

However, in several instances, the participant describing the problem would also state that they knew of a potential solution to their problem, but preferred to avoid resorting to such an action as they perceived it to be ineffective or troublesome. On two occasions, after P3 had given a description of a potential solution, they also included a caveat saying that although the solution worked for them, it may not work for the other partner for their particular problem. P3 stated that they had successfully used small group work in connecting motivated students with unmotivated students, but conceded that “I know not everything’s going to be group work” (P1-P3 conversations, p. 11 line 22).

Agricultural Education – Non-agricultural Education Critical Friend Conversations

P4 and their non-agricultural education critical friend used their critical friendship for slightly different purposes. The recordings of the critical friendship conversations between P4 and the non-agricultural education critical friend were fewer in number and much shorter in length than P1 and P3’s conversations, and thus yielded less data. Data from the conversations between P4 and their critical friend revealed three major themes: establishing common ground as teachers, offering reassurance, and openness to feedback.

Establishing common ground as teachers. Participant 4 (P4) and their critical friend used their conversations to discuss some teaching problems, but spent most of their time reflecting on what happened in their classrooms that week. This discussion of teaching events allowed P4 and their critical friend to establish common ground as educators amid different grade levels and subjects. Similar to P1 and P3, P4 and the critical friend’s teaching problems mainly dealt with student motivation and engagement. P4 said that they were having problems with student motivation towards completing a unit on electricity and that they did not really know how to solve their problem. The critical friend responded by saying “I’ve been having the same motivation issue in my class too” (P4-CF conversations, p. 1 line 15), followed by an example of a solution that they had implemented in their own classroom.

Seeking reassurance. In each conversation, the non-agricultural education critical friend mentioned that they had experienced a similar situation to the one described by P4, and suggested a solution that had worked in their classroom or reaffirmed the action taken by P4. In response to P4’s unmotivated electricity students, the critical friend described a situation where they had successfully used extrinsic motivation to encourage a student:

I have one kid who never gets his work done, and I found out that he will get his work done if he gets some extra reward. If he gets his work done in the morning, he gets to go to his brother's classroom and see their classroom pet after recess every day. (P4-CF conversations, p. 1 lines 5-8)

In discussing how to maintain student motivation before spring break, however, the critical friend said they were having the same problem but did not offer potential solutions. The critical
friend helped P4 confirm that their teaching concerns were not exclusive to agricultural education teachers, and often agreed that solutions utilized by P4 were similar to solutions that they would use in their classroom.

**Openness to feedback.** P4 was receptive to the critical friend’s feedback, and based on later conversations, actually implemented the particular suggestion offered by the critical friend. After the critical friend suggested trying to find a reward of some type to motivate the students, P4 agreed that they had been “trying to think of some…kind of extrinsic motivators like that” (P4-CF conversations, p. 1 lines 21-22), and that “maybe if I...have a reward...that would kind of get them motivated to get this over with so that they can move on to the next thing, or move on to what they want” (P4-CF conversations, p. 1 lines 24-25). P4 expressed belief that the suggestion of using a reward was something that would work for them in their particular situation. In the next week’s conversation, P4 mentioned that “…we finished our lesson in agricultural mechanics, we finished our last electricity lesson on three- and four-way switches, and...it seemed like it finally clicked. They were finally getting it” (P4-CF conversations, p. 2 lines 15-17).

P4 and their critical friend used their discussions to establish common ground, offered reassurance that they were experiencing the same problems and implementing similar solutions, and expressed their openness to feedback. These purposes differed from the purposes sought by P1 and P3; however, interview data from P1, P3, and P4 revealed the same two themes: critical friendship as a valuable experience and critical friendships work under certain conditions.

**Critical Friendship as a Valuable Experience**

Participants agreed that engaging in a critical friendship was helpful for several reasons. The ability to access an outside viewpoint on teaching concerns was a benefit cited by all, a sentiment summarized by P1: “…it helped me so much. It was nice to have somebody to bounce ideas and concerns off of” (P1 interview, p. 2 lines 17-18). P4 identified the outsider’s perspective as one of the benefits of participating in a critical friendship. Having a critical friend in a different educational discipline was perceived as an advantage by P4, who said that the critical friend “wasn’t afraid to tell me what [they] saw from an outsider’s perspective, being not in agricultural education” (P4 interview, p. 3 lines 11-13).

Critical friendships allowed participants to discover things about themselves as teachers of which they were not previously aware. P1 came to realize that they “don’t joke around with my students during lecture time” (P1 interview, p. 4 line 11). Similarly, the critical friend helped P4 realize something about themselves of which they were previously unaware: “I kind of try to make every experience into a learning experience, um, and I guess really had no idea that I did this” (P4 interview, p. 4 lines 14-15). Participants found that being observed by their critical friend was another useful aspect of the relationship as it provided more external input. P1 admitted that they didn’t “necessarily think about, at that moment…so much the things I’m doing as, as whenever I watched somebody else” (P1 interview, p. 2 lines 24-25). P3 identified accountability as an additional benefit of being observed by their critical friend:

When I am observed and someone gives me constructive criticism, I am more likely to apply that to myself. Next time they come and see me, I want it to be perfect. (P3 interview, p. 2 lines 7-9)

P4 echoed this sentiment, but did not adopt any features of their partner’s teaching style because they found their particular settings and situations to be too disparate.
Participants reflected on the usefulness of regularly discussing teaching problems. P4 noted that working with a critical friend helped them examine their teaching problems, and “gave me a chance to not only to vent about the situations that I had, but be working with somebody who is also struggling” (P4 interview, p. 4 lines 29-31). The participants also mentioned that their conversations as critical friends were an opportunity for them to talk about situations that went well during the week, in addition to the parts of their teaching practice they could improve: “I think as much as we talked about what we could change and what we could do different, we talked about...what we were doing and were doing well” (P1 interview, p. 3 lines 7-8). P1 referenced an encounter the two had with a student who told them an inappropriate joke despite the participants’ declining to hear it. The participants had felt unprepared for such a situation and, through the use of each other as a critical friend, reflected on the situation together and brainstormed ideas for what to do if such an incident occurred again in the future: “it was nice to have one another there and talk about what we felt comfortable with allowing and not allowing” (P1 interview, p. 4 lines 6-7).

Another valuable benefit of critical friendship was the opportunity for both participants to observe and experience a different teaching style. For P1, the observation of a peer allowed them the opportunity to reflect on and examine their own teaching practices. P1 talked about how they compare their own teaching style to that of the person they observed:

I really pay attention to what they’re doing and think, am I doing that, or not doing that, or am I doing enough of it, am I doing too much?... Or how can I incorporate what they’re doing and kind of tweak it and make it work in my classroom? (P1 interview, p. 5 lines 27-32)

P4 stated they looked for ideas that would work for them in their particular setting, and noted that observing the critical friend had exposed them to a teaching style that was much different than the lecture-type style to which they had grown accustomed. P4 said the transition from a teacher-centered style to a student-centered style “was different” (P4 interview, p. 2 line 27).

**Critical friendships work under certain conditions.** While they identified the practice as one that helped them improve as teachers, the participants cautioned that their particular situation allowed them to overcome several risks and problems associated with critical friendships that might otherwise impede the establishment of such a relationship. Being open to giving and receiving criticism was identified by the participants as a condition essential to forming a critical friendship. P3 mentioned that “there is [sic] some people I know that can’t handle [criticism] very well” (P3 interview, p. 4 line 14) who “could possibly not do very well in this” (P3 interview, p. 4 line 12). P4 also recognized that giving and receiving criticism could be a major roadblock to establishing a critical friendship:

…if you wanna be a better teacher, and if you ask somebody to observe you and be honest with you, then yeah, be ready for... some criticism, and, if you're not ready for it, then, you know, that might be difficult. (P4 interview, p. 5 lines 2-4)

While participants said they felt comfortable bringing up issues with their critical friend, P1 mentioned that “there was a few times I felt a little hesitant to say something” (P1 interview, p. 2 lines 30-31). P3 believed that some teachers might be resistant to the idea of receiving criticism because “they believe that their teaching style is perfect and everything’s great” (P3 interview, p. 4 lines 23-24). P3 stated that since they were friends with P1 before the study began, they were more comfortable with each other and felt more freedom to give criticism and discuss teaching issues freely. P3 explained they would have found it difficult to give criticism to their critical friend if they “didn’t know [P1] so well” (P3 interview, p. 2 line 16). Like P1 and P3, P4 knew their
critical friend very well before the study, which made it easier to form the critical friendship and facilitate the exchange of honest feedback. The participant noted they were “not sure how other people liked it,” (P4 interview, p. 5 line 14) and they knew “the others are not in the same situation as me, so for my situation, it was great” (P4 interview, p. 5 lines 19-20).

P4 also mentioned that it was easy to accept criticism when they realized their critical friend was offering it in the spirit of helping them improve as a teacher. Similarly, P1 noted that engaging in a critical friendship and practicing giving criticism helped them become more comfortable with the practice, and eventually made it easier to continue being a critical friend: “realizing that [the critical friend] knew I was doing it out of…um, genuine concern and being helpful, it made it a lot easier” (P1 interview, p. 2 lines 32-33). The participants’ philosophies on criticism also appeared to make the potentially controversial exchange of criticism an easier process. P1 stated that “receiving criticism is something I’ve always tried to work on being okay with” (P1 interview, p. 3 lines 2-3), while P3 preferred to receive constructive criticism because the idea of an external expectation of change was a more effective motivator for them than internal expectations. P3 thought the concept may not work as well with teachers who did not see in themselves a need for improvement, and stated that the success of a critical friendship “depends upon what environment it’s used in” (P3 interview, p. 4 line 26).

Conclusions & Recommendations

Data indicated that after listening to the partner’s teaching concern, P1 and P3 would ask a question for clarification and then recommend a solution, technique, or idea they had personally used with success or a method that they had not yet used themselves. Additionally, P1 and P3 both presented sample scripts to each other for use in potentially solving their teaching concern. Costa and Kallick (1993) stated that asking questions for clarification allowed critical friends to better understand the context of their partner’s problem or concern, a characteristic confirmed in the types of questions asked by P1 and P3. The interactions between P1 and P3 support Fritz and Miller’s (2003) findings that requiring communication between agricultural education preservice teachers while student teaching encouraged the exchange of advice and ideas.

Farrell (2001) suggested that “reflection can cause doubt, and that for this reason some people may not want to face any further uncertainties at this stage of their life” (p. 373). In helping each other reflect on their teaching concerns, P1 and P3 revealed doubts about their ability to change themselves or their students. These doubts only represented a small minority of the teaching concerns expressed by P1 and P3, and involved problems that were not easily solved.

P4 and their non-agricultural education critical friend used the critical friend concept mainly to find common ground as teachers. P4 and the critical friend’s successful search for commonalities as teachers supports Fritz and Miller’s (2003) conclusion that agricultural education preservice teachers and preservice teachers in other subjects share the same basic teaching concerns. The presence of this theme supports Swaffield’s (2008) postulation that dialogue, defined as a “search for shared meaning” (p. 328), was an essential feature of critical friendships, as well as Petrarca and Bullock’s (2014) finding that critical friendships help participants find “support and reassurance” (p. 277) in the knowledge that they struggle together.

All participants saw their critical friendship as a valuable experience, which supports conclusions from numerous studies (Baskerville & Goldblatt, 2009; Farrell, 1998; Handal, 1999). Participants stated that the peer observation component prompted them to compare themselves to the peer they were observing, and that they would ask themselves if they were doing what the peer was doing, or were they doing different things than the peer. This aligns with Cosh’s (1999)
definition of peer observation as a technique that encourages awareness of and reflection on one’s own teaching practices. Participants also found that peer observation allowed them to see different styles of teaching and get ideas for their own teaching practice, statements that support Hendry, Bell, and Thompson’s (2014) finding that peer observation allowed participants to learn about new teaching techniques. However, P4 indicated that while the critical friendship did find the critical friendship to be beneficial, they did not gain many new ideas about teaching. This finding is similar to Farrell’s (1998) study, wherein the researcher did not notice any actual change in the critical friend’s teaching practice, but both parties still maintained that they had derived some benefit from the relationship.

**Implications for Practice**

The findings of this study support the idea that critical friendships are a useful technique to help agricultural education preservice teachers connect with agriculture teacher peers and with other teachers. The participants indicated that the critical friendships helped them improve as teachers in some way, and thus it is recommended that agricultural education preservice teachers be encouraged to form critical friendships with their teacher peers during the student teaching experience. However, only half of the preservice teachers invited to participate were able to finish the entire study. Of the non-respondents, one participant assigned to the non-agricultural education critical friend group had initially indicated interest in participating and knew of a potential critical friend they could contact, but dropped out of the study due to scheduling conflicts between the participant and the critical friend. The third participant assigned to the agricultural education critical friend group did not respond to the researcher’s attempts at contact until the end of the study, when they indicated they did not know of any potential critical friend and had decided not to participate. Based on the experiences of five of the six potential participants, familiarity was the most important qualification for a prospective critical friend.

The purpose and results of this study were not designed to provide a definite answer as to which type of friendship was better for teachers, but rather to gain an understanding of how the two types of dyads conversed with one another about their teaching. While the conversations between the two dyads varied in content and direction, with the inter-disciplinary dyad focusing more on establishing common ground than the intradisciplinary dyad, the participants stated that they benefitted from either type of critical friendship. The agricultural education critical friends used their friendship to find new solutions to teaching concerns; the non-agricultural education critical friend pair used the relationship to gain understanding of each other’s teaching practices. Over half of the nation’s agriculture teachers lack an intradisciplinary teaching partner within the same school, and all teachers share their students and their work days with teachers of other disciplines. Professional development events that encourage teachers to establish common ground and gain a better understanding and appreciation of one another’s teaching practices may assist in the formation of interdisciplinary critical friendships.

**Recommendations for Research**

Further research should explore the reasons why the non-respondents chose not to or were unable to form a critical friendship. Research should examine whether participants who decline to participate in critical friendships do so because they did not know any qualifying peers whom they trust or whether they did not want to invest the effort in developing trust in another person while navigating the struggles of student teaching. Further lines of inquiry should also examine whether a critical friendship helps preservice teachers cope with the stress of student teaching or it was too much of a burden to shoulder. It is also possible that the non-respondents were not ready to give and receive criticism from peers on a regular basis.
Research should also seek to replicate this study with more participants. The participants all thought that their critical friendships were successful, and identified the characteristics that made it easier for the relationships to form. Including more participants would allow researchers to find what characteristics discourage the formation of critical friendships. These three were all familiar with their critical friend long before beginning the critical friendship, a condition identified by the participants as making it easier for them to trust each other enough to offer and accept criticism. The effect of spatial distance between participants on the effectiveness of the critical friendship should also be examined. Future research should examine whether critical friends who cannot physically meet on a regular basis derive as much benefit from the relationship as critical friends who are located in close proximity to each other.

Additional research might examine how the critical friendship forms over the course of the semester or how they evolve over the span of a teaching career. This study only analyzed conversations from weeks 4 to 6 of the critical friendship. We do not know what the participants discussed at other times, or whether they continued their critical friendships after graduation. Research should seek to investigate whether teaching concerns discussed by the critical friends change as their experience level increases. Researcher should also look to see if there are differences in the teaching concerns that participants bring to their critical friend and the concerns that they address with their cooperating teacher, and if these concerns overlap.

**Limitations**

Time was a limiting factor in this study. The participants had less than one semester to actively engage with each other as formal critical friends. Since all of the participants were previously very familiar with their choice of critical friend and had convenient access to them during the student teaching experience, it is possible that the participants would have engaged in very informal critical friendships anyway, even without intervention from the researcher. The non-agricultural education critical friend was not briefed on the concept of critical friendship by the researcher. Thus, the non-agricultural education partner may not have been as effective as a critical friend who had gone through the briefing. As the conversations were voice-only, there was no indication of what message the participants transmitted through their body language at the time. P3 did not verbally indicate openness to feedback as often as P1 did; it is possible they indicated this through facial expressions or body language, neither of which could have been detected via the instrumentation used in this study.

This study sought to improve agricultural education preservice teachers’ ability to reflect on their teaching practices via critical friendships, pushing them closer to becoming educators with the “adaptive expertise” (Doerfert, 2011, p. 22) needed to teach students in the 21st century. During the one-on-one interviews, all of the participants indicated that they found being and having a critical friend as beneficial, even though they had different experiences as critical friends. In this study, critical friendships were beneficial to agricultural education preservice teachers, and their use during the student teaching experience is recommended.

**References**


