Research Conference Proceedings

**North Central Region**

**American Association for  
Agricultural Education**



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**Ames, IA**

**Friday, September 22, 2017**

**Review Process for the North Central Research Conference**

The AAAE North Central members express their sincere gratitude to AAAE colleagues who served as reviewers for research abstracts submitted for the 2017 North Central Research Conference. A total of 37 research abstracts were submitted. The AAAE Protocol Guidelines for Conference Paper Selection were used in the paper review and selection process. Eighteen abstracts were selected for presentation at the 2017 North Central Conference held in Ames, Iowa.

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# Friday, September 22, 2017

# Research Session I

## 8:30am to 10:00am

**Hansen Agriculture Student Learning Center**

**Concurrent Session A**

**Room: Iowa Beef Industry Classroom**

**Session Theme: STEM Education**

**Discussant: Ryan Anderson, Sauk Valley Community College**

**Facilitator: Jay Solomonson, Iowa State University**

**Preparing Teachers to Focus on the Naturally Occurring Science within Agriculture**

Nathan Conner, Jeanette Milius, Jamie Loizzo, Christopher Stripling

**Increasing Master Gardener Volunteers’ Motivations and Willingness to Teach STEM Integrated Agricultural Youth Program**

Hui-Hui Wang, Miranda Furrer, John Orick, and Karen Mitchell

**Effects of STEM Projects’ Authenticity in High School Agricultural Mechanics**

Jason McKibben, and Tim MurphyGary Briers

**Preparing Teachers to Focus on the Naturally Occurring Science within Agriculture**

Nathan W. Conner, University of Nebraska-Lincoln

Jeanette Millus, University of Nebraska-Lincoln

Jamie Loizzo, University of Nebraska-Lincoln

Christopher T. Stripling, University of Tennessee

**Introduction/Theoretical Framework**

As educational institutions continue to receive increased scrutiny in regard to funding and student learning outcomes, teachers are asked to challenge students to achieve higher scores on standardized tests and to better prepare students for future careers (Humphreys & Gaston, 2015; Mangan, 2010; McGlynn, 2015). DiBenedetto and Myers (2016) stated that, educational institutions have a primary role in preparing students for the global economy. Interdisciplinary and real-world connections and acclamation to the world of work and educational environments are proven means to provide vital connections for students, resulting in increased learning and higher student achievement (Balschweid & Thompson, 2002).

Agriculture and agricultural related career fields are vital to the nation’s economy. Lundry, Ramsey, Edwards, and Robinson (2015) noted that “agriculture and agricultural related fields employ 24 million workers, and as such, is the nation’s largest employer” (p. 43). Science, as a component of STEM, has a natural ‘fit’ within agricultural education (Chiasson & Burenett, 2001; Chumbley, Haynes, & Stofer, 2015; Myers & Washburn, 2008). Therefore, it becomes ever more important that agricultural education teachers position themselves to be both willing and able to maximize their unique position to capitalize on the ‘natural fit’ of science in agriculture. Students taught in classrooms where science and agriculture are integrated score higher on science achievement tests than students taught only through traditional science classrooms (Chiasson & Burnett, 2001; Roegge & Russell, 1990; Thompson & Warnick, 2007). Research has shown that by utilizing natural connections, students can transfer knowledge to real world applications, resulting in overall increased skills (Chiasson & Burnett, 2001; Shelley-Tolbert, Conroy, & Dailey, 2000; Thompson & Schumacher, 1997).

This study examined how preservice agricultural teachers integrate naturally occurring science (NOS) into their classroom teaching experiences. We operationalized NOS as science concepts and principles that occur within agriculture. Bandura’s (1986) social cognitive theory was used as the theoretical framework. Bandura (1986) posited there is a triadic deterministic causational relationship between personal, behavioral, and environmental factors. For the purposes of this research, Bandura’s framework is operationalized as the following: a) personal factor: teaching ability, b) behavioral factor: Integration of science in the agriculture classroom, and c) environmental factor: teacher preparation through teacher education program.

**Purpose and Objectives**

The purpose of this study was to explore the growth and development of preservice agricultural teachers in the area of science integration. Specific objectives of the study were:

1. To examine how preservice agriculture teachers used new knowledge and existing knowledge to highlight the NOS in agriculture.
2. To determine how preservice agriculture teachers used high school teaching experiences to focus on the NOS in agriculture.
3. To explore preservice agriculture teachers’ perceptions of their teaching ability and comfort level in regard to incorporating NOS in agriculture.

**Methods**

Qualitative research involves the study of subjects in their natural settings and the qualitative researcher positions him/herself in the subjects’ world in order to gain knowledge of their environment, using that information to not only bring meaning to a phenomenon, but to also use this newly found knowledge to promote change in the world (Creswell, 2013). Therefore, qualitative research is heavily embedded in the belief that each social setting is unique, complex, and in constant transition (Denzin & Lincoln, 2011). Merriam and Tisdale’s (2016) basic qualitative approach was used for this study because, “The *primary* goal of a basic qualitative study is to uncover and interpret these meanings” (p. 25).

An important component of unbiased and objective research is the researcher positions him/herself separate and distinct from the subjects of the study. Hatch (2002) stated a researcher in qualitative work must be “reflexive, to keep track of ones’ influence on a setting, to bracket one’s biases, and to monitor one’s emotional responses” (p.10), which in turn aids the researcher in their ability to be close enough to the human action so that they recognize what is occuring. Due to our direct contact with students in the research study, we realize and recognize our biases due to the fact that we have a personal interest and commitment to find answers to the posed research objectives and one researchers taught the course.

This study was conducted in conjunction with an undergraduate agricultural teaching methods course at the University of Nebraska. Each participant completed a 25-hour practicum in a high school agricultural program in which a minimum of 4-hours was spent teaching high school students, during the spring of 2016. There were nine females and one male in the course and all 10 students consented to participate in the study. Two sources of data were collected: (a) written reflective journals and (b) video journals. Data analysis of the written reflective journals and of the transcriptions of the video journals were completed, using the constant comparative analysis method. Constant comparative analysis is both inductive and comparative, allowing the researcher to develop categories/themes of the collected data (Creswell, 2013; Merriam & Tisdale, 2016). Student reflections were first read, reread, and then, methodically memoed for key points. Color-coding was utilized for identification of reoccurring terms/words in the reflective journals. From this initial color-coding, data was categorized and titles for each category were developed. Through phenomenological reduction (relentlessly returning to the essence of the phenomenon) and horizontalization (viewing all pieces of data as equivalent), themes emerged. To help ensure credibility, two data collection methods were used over the course of 16 weeks for data triangulation, multiple investigators analyzed the data, and researchers outside of the study were used for peer debriefing purposes (Lincoln & Guba, 1985).

**Findings**

Completion of data analysis resulted in six themes: (a) expertise and prior experience increases confidence when highlighting NOS; (b) value of students’ prior knowledge; (c) relevance of agriculture/science relationship to real world application; (d) increased student learning when high school students independently identify the NOS; (e) hands-on/interactive activities highlighting NOS enhances student learning; and (f) difficulty by preservice teachers to highlight the NOS.

**Expertise and prior experience increases confidence when highlighting NOS (Research Objective 1)**

Preservice teachers who possess expertise and extensive personal prior knowledge of science content knowledge had greater confidence and find it effortless in identifying and utilizing NOS in their lessons (P1, P2, P5, P6, P8, and P9). Possessing a vast amount of knowledge and/or experience in the subject content increased the preservice teachers’ self-efficacy, making them feel they were a better teacher and were providing accurate information to students (P1, P2, P5, P6, P8, and P9).

**Value of students’ prior knowledge (Research Objective 1)**

As noted by preservice teachers in their reflections, the challenge of integrating NOS in the classroom is minimized when they recognized and exploited the students’ current knowledge of science (P1, P3, P4, P5, P8, and P9). This will result in NOS occurring with little or no interaction by the preservice teacher. Participant 1 indicated the need in lesson planning “to think in terms of what they already knew and build off of prior knowledge”. Participant 4 stated, “This lesson reminded me of how much knowledge that incoming freshman may have”.

**Relevance of agriculture/science relationship to real world application (Research Objective 2)**

Preservice teachers expressed the importance of being able to show students the value of NOS (P1, P4, P5, P6, P7, P9 and P10). Often, the real world application is present, but one does not directly realize it (P4). Sometimes it will be necessary for the preservice teacher to point out the real world application, a connection that is invaluable (P6). Participant 6 stated, “Make sure to point out to students that they may have already learned something similar in their science classes but that this is one of the few things that it gets used for in ‘real’ life.”

**Increased student learning when high school students independently identify the NOS (Research Objective 2)**

Preservice teachers indicated that students who independently find the correlation of NOS to agriculture guide their own learning and achieve greater learning outcomes (P2, P3, P6, P10). Participant 1 stated: “student questions and previous knowledge also helped guide and highlight science as they made connections themselves and felt proud when they were able to apply what they already knew to the lesson.”

**Hands-on/interactive activities highlighting NOS enhances student learning (Research Objective 2)**

Preservice teachers documented that the use of a multitude of hands-on/interactive activities in the classroom allowed for the agriculture/science alliance to be *brought to life*, which enhances student learning (P2, P3, P4, and P8). Use of a variety of hands-on interactive activities not only kept students engaged, but also supporting diversity in teaching, allowing for the connection to a variety of learning styles (P3).

**Difficulty by preservice teachers to highlight the NOS (Research Objective 3)**

Preservice teachers will individually, at times, fail to find the correlation of science to agriculture, resulting in their inability to find and highlight NOS in lessons being taught to their students. Participant 1 stated,

When it works it makes sense and should be done, but there are countless lessons in every class we will teach where it won’t be applicable as well. Agriculture education should be well rounded and in following the theory of doing so when appropriate and not forcing it is very important.

Several other preservice teachers expressed this same concern, stating that they felt NOS should not be ‘forced’ into the lesson (P2, P5, P6, P9).

Whether it is due to the ‘true’ lack of NOS in all lessons, or due to the fact preservice teachers lack adequate knowledge and self-efficacy in teaching science to draw those correlations, participants noted several times their own personal difficulty in highlighting NOS in the lesson. The lack of efficacy was recognized by Participant 2, “The more I practice the better I will be at teaching this lesson and perfecting it for my students”.

**Recommendations and Implications**

As recorded in reflections from preservice teachers’ journals, if a preservice teacher had prior knowledge or personal experience, on the topic of the lesson, they were better able to seamlessly integrate NOS in the lesson they were teaching. Preservice teachers possessing teaching efficacy (confidence) in the agricultural lesson were better able to visualize and articulate NOS to their students, which aligns with Bandura’s (1986) concept of self-efficacy. Preservice teachers need to strive to design lesson plans that use learning activities that build upon the prior knowledge and experience of the students, which aligns with Haynes, Robinson, Edwards and Kay’s (2015) assertion that students are “capable of learning better when information is presented to them in a way that it relates to their personal experiences” (p. 23). The incorporation of prior knowledge should allow the teacher to help the student make sense of NOS in agriculture. Additionally, preservice teachers play an important role in helping students identify the NOS they are learning in class and how it can be used in their daily lives. Building the connection of agriculture to science opens many potential career paths for students, which is critical since the agricultural industry is a huge employer in the United States (Lundry, Ramsey, Edwards, & Robinson, 2015). Preservice teachers confirmed in their journals that increased motivation and engagement was evident when high school students participated in hands-on classroom activities, which allowed for science and agriculture to be taught in conjunction with each other. Finally, when teaching a lesson corresponding to their own prior interest or experiences, preservice instructors felt a high level of comfort and confidence in the classroom, however, when the lesson related to unfamiliar topics or concepts, preservice teachers struggled with integrating NOS in the agricultural classroom.

Agricultural education teacher preparation programs should modify existing courses or design new courses to specifically help preservice agriculture teachers become comfortable with integrating NOS in school-based agriculture courses. Future research should be conducted to better understand the impacts of highlighting NOS in agricultural classrooms. Specifically, attention should be given to how highlighting NOS in agricultural influences student achievement on standardized tests and career choice.

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**Increasing Master Gardener Volunteers’ Motivations and Willingness to Teach STEM Integrated Agricultural Youth Program**

Hui-Hui Wang, Assistant Professor, Purdue University

Miranda Furrer, Master’s Student, Purdue University

John Orick, Purdue Master Gardener State Coordinator, Purdue University

Karen Mitchell, Extension Educator, Purdue University Extension

**Abstract**

Master Gardeners have an important role in their communities as educators for home horticulture topics, typically for an adult audience. These volunteers are often looking for new and exciting ways to get involved (Mayfield & Theodori, 2006). Through this mixed methods study, we looked at Master Gardener volunteers’ motivations and willingness to teach a STEM integrated agricultural youth program in their community. Upon completion of a Professional Development event, Master Gardeners learned new information measured quantitatively through a questionnaire, and had motivations relating to achievement, affiliation, and power which were measured qualitatively through post-program interviews. Results from this study give new insight to what makes Master Gardener (MG) volunteers motivated to help with new programs, specifically involving youth audiences.

**Introduction**

It is essential to educate young people about the importance of complex agricultural issues, such as pollinator decline, and encourage them to join the agricultural workforce. Agriculture provides an opportunity to engage youth in activities they would not experience in a traditional classroom. There continues to be a growing interest in educational programs with science, technology, engineering and mathematics (STEM) integration. This interest is largely due to a need for more qualified STEM educated employees, specifically in agriculture (US News World Report LP, 2015; Roberts, Harder, & Brashears, 2016). One of the main roles involved with a STEM-integrated program is to help youth apply relevant STEM content to solve a real-world problem by using design thinking (Cantrell & Robinson, 2002; National Research Council, 2009).

However, there is a critical shortage of agricultural educators across the U.S. in the formal classroom setting (NAAE, 2012). To increase the number of agricultural educators, volunteers are potential human power that may address the needs, through non-formal education and extension education. Extension Master Gardener (MG) programs exist in all 50 states (Langelletto, Moen, Straub, & Dorn, 2015). The focus of the Extension Master Gardener program is on home horticulture related topics (Gibby, Scheer, Collman, Pinyuh, & Fitzgerald, 2008). Currently, topics for Extension Master Gardener core training do not include delivering youth targeted curriculum using STEM integrated concepts. Training Master Gardener volunteers to teach youth about critical thinking and reasoning by integrating STEM in a context of horticulture related topics is an innovative approach to help with the shortage of employees for agricultural positions (AAAE National Research Agenda Research Priority #5, 2016). There is a need for more research on how to motivate and prepare volunteers, such as MGs, to teach STEM integrated agricultural youth programs that focus on reasoning and critical thinking.

**Purpose and Hypotheses**

The purpose of this study was to investigate the factors influence MGs’ motivations and willingness to be trained and implement a STEM integrated agricultural youth program that focused on reasoning and critical thinking. Our proposition was that the three sources, achievement, affiliation, and power, play important roles that have impacts on MG volunteers’ motivation (Atkinson & Birch, 1978; Wolford, Cox, & Culp, 2001). Yet, in addition to the three sources, there are other factors that may have influence on MGs’ motivations and willingness to be trained and implement the program.

**Research Questions**

What factors describe the MGs motivations and willingness to be trained to teach a STEM integrated youth program that focuses on reasoning and critical thinking by using horticulture topics?

**Methods**

The research is a mixed methods research study. Quantitative methods were used to explore MGs’ experience of participating in a professional development training and their level of comfort teaching certain horticultural topics. A qualitative case study method was used to better understand motivations and willingness of MGs after teaching a STEM integrated agricultural youth program.

Context of Training and the STEM Integrated Agricultural Youth Program

*Professional development training*. The Professional Development (PD) training was held in November 2016. The training was two days and each day was four hours. Nine MGs participated in the training. The PD focused on teaching methods that help youth use reasoning and critical thinking, STEM content knowledge, and hands-on activities that are used in the lesson plans. The PD topics included evidence-based reasoning, material impact on nature, soil science, plant science, bee identification, pollinator and flowers, engineering and engineering design, weather, and planning a pollinator garden. Each lesson builds upon the previous one, and is designed to help students use reasoning and evidence to make a claim. All materials were provided to participants, including lesson printouts, binders, and supplies.

*The STEM integrated youth program*. 12-week program (10 lesson plans) had a large focus on science, but it also incorporates the other areas of STEM. The program was taught by the trained MGs. The program began February 2017. The program met once per week for 1 hour with at least two students from the 4th-6th grade after-school class. Two MGs paired up to teach each lesson plan. They had freedom to choose the topics that they wanted to teach and whom they would partner with. On average, each MG signed up to teach 2 lesson plans. MGs were encouraged to come to the program and observe others teaching, even if they did not sign up for that week.

Data Collection

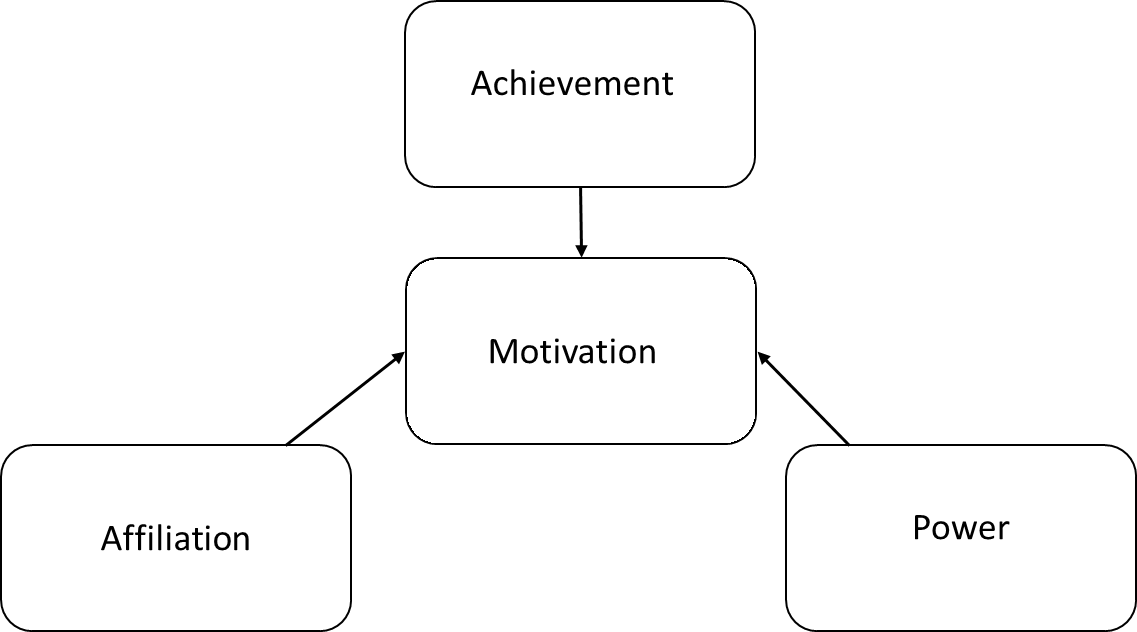
Two data sources, a questionnaire following the PD event and interview following completion of the youth program, were collected. The survey had 20 questions total that included both 5-point scale and open-ended questions. Six out of nine MGs completed the survey without leaving any question unanswered (~66% response rate). The post PD survey aimed to explore (a) how comfortable do you feel to teach the topic after the training, (b) how useful are the lesson plans and training, and (c) how to improve the training. As for the semi-structured post program interview, each interview was about 30 to 45 minutes. Five MGs, who were trained and helped implement the program, were interviewed. Criteria used to select the volunteers were (a) how many years the participants have volunteered as a MG, and (b) how many times they taught the youth program. The interview questions aimed to investigate (a) what motivated volunteers to be trained and implement the program, and (b) looking back on their experience, what are the challenges they encountered when they implemented the STEM integrated agricultural youth program.

Data Analysis

Data analysis focused on identifying factors that have influences on volunteers’ motivation to teach the STEM integrated agricultural youth program. Using an interpretivist paradigm, this lead to the use of the Atkinson and Birch framework (Figure 1) as a way of organizing the data. Descriptive mean was used to analyze the survey data. As for the interview, holistic coding (Saldaña, 2016) was used to generate central concepts. After central concepts were generated, analysis focused on creating themes and eventually assertions (Saldaña, 2016).

**Theoretical/Conceptual Framework**

Numerous research studies report the importance of providing training opportunities and educational resources to volunteers, ensuring a successful volunteer program (Cummins, 1998; Hoover & Connor, 2001). Yet, researchers have limited knowledge about what factors motivate volunteers to be willing to be trained and implement the educational resources that are provided. The study used Atkinson and Birch’s (1978) three different sources of human motivation as the basic theoretical framework to explore what factors may relate to each source that have influences on volunteers’ motivations and willingness to be trained and implement STEM integrated agricultural youth programs. Several other studies have looked at motivations of adult volunteers using the theory proposed by Atkinson & Birch, 1978. One study done by Culp & Schwartz, 1999, looked at the factors motivating 4-H volunteers to begin and continue their volunteer service, which were separated into the categories of achievement, affiliation, and power. Achievement motives are those in which individuals take pride in their accomplishments and have a desire to achieve excellence (Culp & Schwartz, 1999). Affiliation drives people to be concerned about their relationships with others. Power drives individuals to have control and influence (Culp & Schwartz, 1999). The three sources of motivation are shown below in Figure 1.



*Figure 1*. The relationship of the three sources of motivation (Atkinson & Birch, 1978)

**Results**

Post PD Survey

All of the MGs that participated in the PD event have some college experience, professional degree, or more than bachelor degree in animal science, special education, engineering, or communication. All of the MGs have teaching experience prior to the training, and 60% of them have teaching experience with youth. They all claimed that they have not taught a STEM integrated youth program prior to the training. Three out of six participants have been serving as a MG for 5-10 years, and the other three participants have served for 1-4 years. Overall, the results indicate that the training was successful in helping participants feel more comfortable with each topic, which can be seen in Table 1. Participating in hands-on activities during the PD event appeared to help MGs feel more comfortable, even in topics they were not as familiar with, such as designing a bee nest.

*Table 1*.

Pre and post comfortable level of teaching each lesson plan with standard deviations (N=6; Scale 1=extremely uncomfortable, Scale 5=very comfortable)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Bee identification | Pollinators and flowers | Soils | Plant science | Design a pollinator garden | Design bee nests (E-design) |
| Pre mean | 3 | 3.5 | 3.17 | 3.5 | 3.5 | 2.67 |
| Standard Deviation (pre) | 1.10 | .84 | 1.47 | .84 | 1.64 | 1.51 |
| Post mean | 3.67 | 4.5 | 4 | 3.83 | 4 | 3 |
| Standard Deviation (post) | 1.37 | .55 | 1.26 | .98 | 1.67 | 1.55 |

Post Program Interview

*Achievement*. One factor, willing to try/learn new things, related to Achievement source that had influence on MGs’ motivations. For example, when we asked why MGs want to volunteer for the STEM integrated agricultural youth program, Volunteer B said, “I was curious. I’m always curious. I’m always a learner.” Volunteer D said, “Actually, I thought I was gonna learn more about pollinators.” Volunteer E said, “I was always trying…Even though I didn't know exactly what is going to involve. I thought, ‘well, I’m trying…’”.

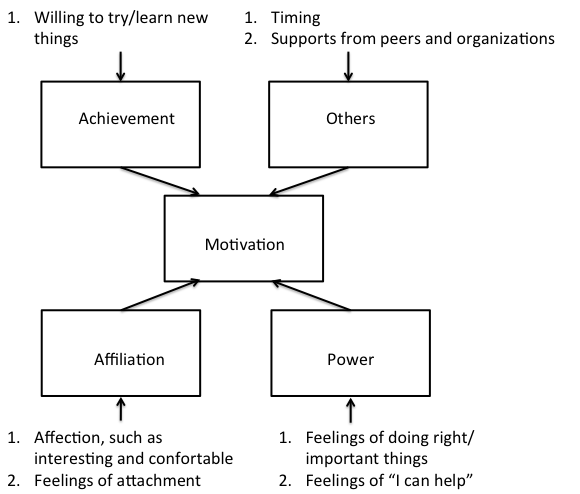
*Affiliation*. Two factors, affection and feelings of attachment, related to Affiliation, had impacts on MG’s motivations. Volunteers want to do something they enjoy, and they are interested in/feel comfortable about the subjects. For example, when we asked why MGs chose the topic that they taught, Volunteer D said, “I’m with plants all the time. I am comfortable about teaching plants”. Volunteer E said, “I also like the idea having pollinators and learning more about pollinators. In our own yard, we’re planting flowers to attract pollinators.” As for feelings of attachment, when we asked interviewees why volunteer MG and the youth program, volunteer A said, “I grew up on a farm…I wanted to get back to the Agriculture”. Volunteer B said, “My husband is an engineer. I think the problem solving aspect of engineering is what I like,” and volunteer E said, “My dad had a garden and I didn’t do a lot to help him when I grew up…”

*Power*. Two factors, feelings of “I can help”, and feelings of doing the right/important things, related to Power source that had influences on MG’s motivations. For example, Volunteer A said, “if it’s not people like us [MGs] helping these kids that haven’t been exposed to it [bees]…, they may not know anything about pollinators”. Volunteer B said, “I always like to help others who are trying to find a way in which to engage young people…” Volunteer C said, “ I think a lot of them [MGs] see it [volunteering] as a responsibility to next generations…I believe exposing kids to science is an important thing”. Volunteer E said, “I think it’s just this idea, too, of changing students’ minds about what they eat, being good stewards of the earth. I just think that’s so important.”

*Other factors*. All five volunteers indicated that timing is a critical factor that had influences on if they want/can be trained and implement the program. In addition to timing, peer and organization support were also considered as important factors that have influence on volunteers’ motivations and willingness to be trained and implement a STEM integrated youth program.

**Conclusions/Discussion**

Our results support our proposition that achievement, affiliation, and power play important roles impacting MG motivation. However, our results, shown in Figure 2, also show that a non-traditional program may only attract MGs who are willing to try and learn new things. Figure 2 shows the three motivations from Atkinson & Birch, 1978, plus an additional category of ‘other’. The factors that we found to be important were taken from the post-program interviews. The expected achievement, affiliation, and power values were found, but there was also an additional category that included support and timing of program. Timing of the program was a challenge in this study, because only certain MGs were able to teach the program, due to other commitments. When designing a new program and PD, it is important to address MGs’ personal values, and their affection and feelings of attachment. For example, a STEM integrated youth program should combine some topics that MGs feel comfortable teaching, such as growing vegetables and testing soil, and new STEM components, such as engineering design. In addition, timing of the program and PD is also important. For example, many MGs are very busy working on gardens during summer. Therefore, to successfully start a new program and PD, extension educators should avoid the busiest time for MGs, typically summer. In addition, it is important to have peer support. Therefore, inviting MGs’ who are trained and have implemented the program to talk to other MGs could help motive additional volunteers. If organizations provide all teaching materials, such as lesson plans, PowerPoint slides, handouts and worksheets, and so on, MGs could also increase their motivations and willingness to volunteer for the new program and PD.



*Figure 2.* Factors that have impact on MGs motivations and willingness to be trained using horticulture topics in a new way to teach a STEM integrated youth program

**Limitations/Recommendations**

The study results cannot be generalized due to small simple size. Therefore, the factors that are found may not apply to all the Extension Master Gardener (MG) programs across all 50 states. However, we can see, based on the literature and previous studies regarding volunteer motivation, there is a need for more research to be done. Agricultural education is an important subject for students to be aware of and be active in, yet there is a shortage of agricultural instructors, in both formal and non-formal settings (NAAE, 2012). Master Gardeners have experience working with people and educating them about topics such as botany, soil health, vegetables, native plants, and much more (Penn State Extension, 2017). Future research can look at ways to get volunteers engaged and keep them engaged. We know that many of the volunteers in our Master Gardener program were motivated by their investment in future generations. With this enthusiasm, MGs are the perfect match for the non-formal agricultural education for youth audiences. The volunteers are willing and ready, but need support from extension staff and provided with adequate training.

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**Effects of STEM Projects’ Authenticity in High School Agricultural Mechanics**

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**Introduction**

Agricultural education, a primarily practical and experiential segment of education (Newcomb, McCracken, & Warmbrod, 1993; Phipps & Osborn, 1988), is a prime place to give credence, context, and relevance to the information taught in core area classes (Lee, 1994; National Research Council, 1988). Purposefully integrating science concepts into agriculture course work has a net positive effect for both students in agriculture and students in science (Clark, Parr, Peake, & Flanders; 2013; Chaisson & Burnett, 2001; Enderlin & Osborne, 1992; Myers & Dyer, 2006; Myers & Thompson, 2009; Rickets, Duncan & Peake, 2006). The opportunities to integrate the concepts of science, primarily physics and chemistry, along with mathematics, engineering, and technology, make agricultural mechanics courses a logical place to focus integration efforts (Blackburn, 2013; Edney, 2009; Scales, Terry, & Torres, 2009).

At the core of this study was an examination of how one of the foundations of agricultural education, project work (Dewey, 1916, 1938; Hummel & Hummel, 1913; Kilpatrick, 1918, 1925; Stimson, 1915, 1919), can affect the integration of STEM concepts. The use of projects extends into the classroom, outside of the examined SAE context. Roberts and Harlin’s (2007) work on the implementation of projects in agricultural education leads to the belief that, in the years since the founding of formal school-based agricultural education, project focus has shifted from a two faceted approach of school and home based projects to focusing exclusively on out-of-school projects. Krajcik and Blumenfeld (2006), as well as Grenno (2006), advocated for the use of projects in the classroom as way to learn through situated perspectives in the general learning environment (Grenno, 2006).

The use of project-based learning outside of agricultural education is primarily focused on implementation within the school setting. Researchers have reported many criteria or elements to effectively implement projects in the classroom (Blumenfeld, Soloway, Marx, Krajcik, Guzdial, & Palinscar, 1994; Krajcik & Blumenfeld 2006; Krajcik, Czerniak & Berger, 2002; Larmer & Mergendoller, 2015). Some of those elements have not been well defined or researched before thoroughly they were suggested as necessary (Personal communication Mergendoller, October 15, 2015; Personal communications Larmer, October 12, 2015). One element lacking clarity is the element of authenticity.

Authenticity is said to pertain to the likelihood of that project being in the real world (Larmer, 2012; Larmer & Mergendoller, 2015). Authenticity, as one of the project design elements, can be understood to affect the quality of instruction as defined by Carroll (1989). Quality of instruction, and the four other criterion that define the model of school learning as postulated by Carroll (1963, 1989), are understood to effect the levels of academic achievement. As such, any change in the quality of instruction, if all other things are kept constant, should consequently change academic achievement (Carroll, 1963, 1989).

**Framework**

The increase of authentic experiences in classroom instruction is in line with Carroll’s (1963, 1989) model of school learning and Bandura’s (1977) social learning theory. Carroll (1963) proposed students differ in the amount of time they need to learn, which he referred to as aptitude. Carroll (1963, 1989) proposed aptitude as the antecedent to academic achievement, in which the relationship between aptitude and academic achievement may be positively and/or negatively affected by four intermediary factors: (a) opportunity to learn, (b) ability to understand instruction, (c) quality of instruction, and (d) perseverance (Reeves & Reeves, 1997). This study was situated in the quality of instruction subcategory of Carroll’s 1989 model as I attempted to examine the effects of authenticity on the quality of instruction. Quality of instruction is an environmental determinant as descried by Bandura (1977).

Social learning theory (Bandura, 1977) frames learning as a triadic relationship between three determinants: behavior (*B*), environment (*E*), and cognition (*C*). Movement or alterations made in any one of the three determinates will result in changes in one or more of the other two. Use of SLT allows researchers to predict that any change in the environment should result in a change in cognition. Using Bandura’s model, I focused on the purposeful change of authenticity (*E*), measuring the resulting change in cognition (*P*) while using guided behaviors (*B*) within the framework of a hands-on lesson.

**Purpose and Hypothesis**

The purpose of this quasi-experiment was to test the effect of the environmental determinant, level of authenticity, on academic achievement in physics.

HO: There will be no differences in academic achievement score changes (OΔ = O2 - O1) among the groups.

X1 (OΔ) = X2 (OΔ) = X3 (OΔ) = X4 (OΔ)

**Methods**

As part of a larger study, I conducted a quasi-experimental study to test how real and/or authentic projects need to be to affect learning. Agriculture Food and Natural Resources students in [state] were sampled and assigned as a cohort group to one of four treatment groups (*N* = 219)*.* Fourteen cohort groups (class periods) were identified in five sites. I assigned randomly each of the 14 cohort groups to one of the four project types varying in their design according to the degree of project authenticity when learning about electricity. Level of authenticity was varied based on suggestions made by Larmer and Mergendoller (2015), Table 1. Those treatments in decreasing level of authenticity were Wiring, Drawing, Squishy, and Paper Packet. I used analysis of covariance (ANCOVA) to test the effects of project authenticity on change scores in a pretest posttest quasi-experimental design.

Table 1

*Requirements for a Project to be Considered Authentica*

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | a | b | c | d | e | f | g |
| Treatment A (X1)  Paper packet |  |  |  |  |  | U |  |
| Treatment B (X2)  Squishy circuit wiring |  |  |  |  | S | U | S |
| Treatment C (X3)  Drawing of a wiring diagram | S | S |  |  | S | U | S |
| Treatment D (X4)  Wire using wires | S | S | S | S | S | U | S |
| *Notes*. a Larmer and Mergendoller (2015) outlined seven requirements for a project to be considered authentic: a) involve in a real-world process, b) have actual impact on others, c) be based in real performance standards, d) use industry appropriate tools, e) involve the building or creation of something that will be experienced by others, f) be deemed personally important, and g) be involved in context (Larmer & Mergendoller, 2015). S = Satisfying or exceeding the requirement. U = unknown beforehand. Blank cell = not meeting the requirement. | | | | | | | |

Paper packet (Treatment X1) was a commercially available packet of information, readings, fill in the blank questions, true/false questions, and short answer questions commonly used as curriculum support in Texas agricultural education. Squishy circuits (Treatment X2) were a wiring proxy using electro conductive dough similar to Play-doh® and probe-based loads. The dough acted as a conductor and could be adjusted for conductivity by altering the mixture. Students were also given a power source and a selection of lights. The students were given the doughs, which are proxy for typical wiring materials, and instructed to construct a working series and parallel circuits. The students assigned to draw a diagram (Treatment X3) were asked to draw out a diagram for a parallel and series circuits. Students were given markers and poster paper to ensure the materials available were the same, thus helping to ensure treatment fidelity. Those students assigned with wired circuits (Treatment X4) were given materials to construct working series and parallel circuits. Those materials were lights, power sources, wires, and light terminals. In all hands-on projects, students explained how power would move through the circuits working the loads, during an oral presentation, as is best practice (Buck, 2015).

All knowledge assessment items were taken from The Massachusetts Comprehensive Assessment System (MCAS). The assessment was comprised of 23 multiple-choice items. The assessment was centered on questions that probed students understanding of the electrical system from the theoretical (Ohm’s law and electron theory) to the physical (which of the listed items is a conductor and which light will be illuminated if a certain switch is activated). The MCAS was selected due to the high percentage of Massachusetts students who pass the physics electricity and magnetism advanced placement exam (College Board, 2014). I selected the MCAS exam because it is used to test the students at the state level, and students who score well on the MCAS score well on the national exam administered by the College Board. The belief was that this exams’ assessment would resemble, though not be directly comparable to, the more nationally recognized exam.

**Findings**

Pretest, previous coursework, and grade in school, were used covariates in the analysis. Field (2013) suggests that all covariates be tested against the independent variable to ensure their independence of any assignment. These data were tested as prescribed and all covariates were determined to be independent. Descriptive statistics for treatment are in Table 2.

Table 2

*Descriptive Statistics for Change Score (DV) by Treatment (IV)*

|  |  |  |  |
| --- | --- | --- | --- |
| Treatment | M | SD | *n* |
| Wiring | 0.00 | 14.03 | 50.00 |
| Squishy | 5.77 | 14.08 | 61.00 |
| Drawing | 4.52 | 12.46 | 25.00 |
| Paper Packet | -2.46 | 13.61 | 23.00 |
| Total | 2.57 | 14.00 | 159.00 |

Tested at the (α = .025) level to guard against rising change of Type I error due to an increase in number of tests, the results of a calculated ANCOVA would indicate that statistical differences do exist when different levels of authenticity are applied to the project-based methods (F(3,145) = 3.59. *p* = .015). However, this finding has a low to medium effect size (ω2 = .04).

Differences between treatments were tested post hoc using pairwise comparisons. Statistically significant differences were detected at the (α = .05) level for treatments: squishy circuit at wiring (*p* = .038) with a mean difference of 5.19 positive toward the squishy treatment, squishy circuit at paper packet (*p* = .002) with a mean difference of 9.93 positive toward the squishy circuit treatment, and drawing at paper packet (*p* = .049) with a mean difference of 7.43 positive toward the drawing treatment (Table 3). It should be noted that the wiring treatment, the most authentic, did not yield significantly higher scores than any of the treatments.

Table 3

*Pairwise Comparison of Change Score (DV) by Treatments (IV)*

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| *(I) Treatment* | *(J) Treatment* | *Mean Difference (I-J)* | *Std. Error* | *p* | *95% Confidence Interval for Difference* | |
| *Lower bound* | *Upper bound* |
| Wiring | Squishy | -5.19 | 2.47 | .038\* | -10.08 | -.30 |
| Drawing | -2.69 | 3.15 | .395 | -8.92 | 3.54 |
| Paper Packet | 4.74 | 3.21 | .142 | -1.61 | 11.09 |
| Squishy | Drawing | 2.50 | 3.02 | .410 | -3.48 | 8.47 |
| Paper Packet | 9.93 | 3.19 | .002\* | 3.62 | 16.24 |
| Drawing | Paper Packet | 7.43 | 3.74 | .049\* | .04 | 14.82 |
| \*significant at the *p* =.05 alpha level. | | | | | | |

**Conclusions and Discussions**

Larmer and Mergendoller said that to properly implement projects in the frame of project-based learning, projects must have “high levels of authenticity” (2015). I found in this study that authenticity did indeed play a part in educational gains of students, thus concurring with Larmer and Mergendoller (2015). However, those gains were not directly related to the authenticity of a project. Gains for students engaged in the most authentic project, a hands-on activity, and gains for students engaged in the least authentic, an activity that was not hands-on, were not significantly different. This is consistent with the Johnson, Wardlow, and Franklin’s (1997) findings that traditional paper and pencil activities yield the same academic results as hands-on activities to teach physics in agricultural mechanics. Johnson et al. (1997) noted that their projects, while hands-on, did not stimulate interest. The results of this study reflect that the stimulation of interest in the learning process is more likely to present itself using projects with medium levels of authenticity.

According to results in this study, the fully authentic project (wiring a circuit using wires, switches, and loads) did not appear to provide any better opportunities for students to learn the STEM concepts than reading a paper packet and answering questions, as is consistent with previous research. The differences appeared when the two projects with medium levels of authenticity are examined. The second most authentic project involved participants drawing wiring diagrams. This project group yielded statistically better results than the paper packet group but not statistically different results than the wiring group. The least authentic hands-on project, squishy circuit had a statistically higher change score than both wiring, the most authentic, and paper packet, the least. These two mid-level authenticity projects were not statistically different from each other.

What did these two mid-level authenticity projects have in common with each other, not seen in the other projects? Using the definitions set forth in Table 1, nothing. None of the requirements suggested by Larmer and Mergendoller (2015) was in the mid-level authenticity projects that were not also present in the fully authentic wiring project. Though authenticity can be pointed at as being important, it is not paramount to the learning of STEM concepts in agriculture. In the context of this study, teachers and designers of curriculum should feel empowered to stray from the norms of “real-world” and into more divergent projects that stimulate student interest and creativity.

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**Concurrent Session B**

**Room: Iowa Dairy Farmers’ Classroom**

**Session Theme: Secondary Ag Ed Programs**

**Discussant: Amy Smith, University of Minnesota**

**Facilitator: Trent Wells, Iowa State University**

**Barriers to Becoming CASE Certified**

Kristin Witte, Nathan Conner, Bryan Reiling, Mark Balschweid, Christopher Stripling

**Literacy Integration Considerations of Secondary Agriculture Teachers**

Laura Hasselquist, Tracy Kitchel

**Drivers of Practice and Literacy Integration Experiences of Secondary Agriculture Teachers**

Laura Hasselquist, Tracy Kitchel

**Barriers to Becoming CASE Certified**

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**Introduction**

In general, knowledge of science and mathematics in the United States is lacking. Results of the 2012 Programme for International Student Assessment (PISA) indicates that American students performed close to the average score in the area of science, which ranks the United States at 20th out of 34 countries (Schleicher and Davidson, n.d.). The American Association for the Advancement of Science (AAAS) (1999) launched Project 2061 in 1985, as a long term effort to improve science, mathematics and technology. Maurer (2000) in his brief *Integrating Science Education and Career and Technical Education,* states “educators must discover how academic subjects such as science can be a more integral part of career and technical education (CTE)” (p.3).

According to Brister and Swortzel (2009), secondary agricultural education courses are excellent platforms for science education. Additionally, Knobloch, Ball, and Allen (2007) found that teachers believe agriculture provides an authentic learning context for students and that authentic learning helps students connect concepts to everyday life. The findings of Knobloch, Ball, and Allen indicate that teachers believe students benefit from laboratory activities, demonstrations, and active learning environments that incorporate hands-on learning. However, Balschweid & Thompson (2002) identified three barriers to integrating science into agriculture courses: a) lack of appropriate equipment, b) lack of funding to support their efforts, and c) a lack of in-service workshops or courses for learning how to integrate science into the curriculum. To assist agricultural education teachers in incorporating science into agriculture courses, the Curriculum for Agriculture Science Education (CASE) was developed. The CASE curriculum is designed to “empower the students by providing students an active role in their learning rather than learning being a product of teacher led instruction” (CASE, 2012., p. 3). CASE is a system of instructional support for the classroom teacher that includes curriculum, professional development, assessment and certification (CASE, 2012.). Teachers must attend a CASE training to learn about curriculum by completing the hands-on assignments, similar to what they will expect from their students.

**Theoretical Framework**

The theoretical framework used for this study was Ajzen’s (2011) theory of planned behavior, which states,

Human behavior is guided by three kinds of considerations: beliefs about the likely

outcomes of the behavior and the evaluations of these outcomes (behavioral beliefs),

beliefs about the normative expectations of other and motivation to comply with these

expectations (normative beliefs), and beliefs about the presence of factors that may

facilitate or impede performance of the behavior and the perceived power of these factors

(control beliefs) (p. 1).

As described by Ajzen, “responses can be used to identify personal accessible beliefs, i.e., the unique beliefs of each research participant, or to construct a list of modal accessible beliefs, i.e., a list of the most commonly held beliefs in the research population” (p.14).

**Objectives**

While there has been a push for science integration into Agriculture classrooms, many teachers have not become CASE certified. The objective of this research was to determine the obstacles that prevent agricultural education teachers from becoming CASE certified.

**Methods and Procedure**

This study used a semi-structured interview methodology with open ended questions that were developed based on the purpose of the study. Interviews were audio recorded and transcribed verbatim. One interview was conducted with each participant, lasting approximately 30 minutes. Probing questions were used to encourage participants to further explain their responses. The interview questions are listed below:

1. What is your gender?
2. What was your undergraduate degree in?
3. How long have you been teaching?
4. What science classes did you take during your undergraduate work?
5. In your opinion what is the most important thing to teach in agriculture classes?
6. On the agriculture education spectrum with one being preparing students with vocational training and 10 being preparing them for college where do you find your program? Why?
7. What is your perception of Curriculum for Agriculture Science Educators or CASE?
8. What content knowledge and skills do you believe you would receive from being CASE certified?
9. Have you considered becoming CASE certified? Why or why not?
10. What are benefits you have heard of or seen to being CASE certified?
11. What are challenges to you becoming CASE certified?
    1. If time, how much time would you be willing to give to become certified? Explain
    2. Would you be willing to do a online training, or pre work prior to attending?
    3. Cost, would a scholarship to cover the cost of the institution and purchasing some supplies be helpful? Why or why not?
12. Based on your current curriculum needs, what classes would you want to be CASE certified?
13. Is there anything else that would help you overcome these challenges?
14. Would administration encouragement/support influence your decision to become CASE certified?
15. Can you think of any other ag teachers who aren’t CASE certified who I should be speaking with?

The population for this study was high school agriculture teachers in Nebraska. In order to be purposefully selected for this study, the following criteria had to be met: 1) not be certified in any CASE course, 2) not be attending a CASE institute this summer, 3) be employed for the upcoming school year as a high school agriculture teacher, and 4) have taught high school agriculture for at least one year. Once participants were selected and consent given, participants were assigned the letter P and a number in order to protect their identity. The snowball sampling method was used to encourage participants to identify individuals that meet the criteria. Data were analyzed using thematic analysis. More specifically, the block and file approach (Grbich, 2007) was used because as it allows for recurring patterns and themes to be color-coded and separated into themes and sub-themes. Lincoln and Guba (1985) identified multiple techniques that could be used to help ensure the trustworthiness of qualitative research. Triangulation, member checking, peer debriefing were used throughout this study.

**Findings**

Overarching themes were: perceptions of CASE and Barriers to Becoming CASE Certified. Additional subthemes were also identified.

**Perception of CASE**

**Positive Aspects.** Most research participants have a positive view of the CASE model. P3 stated, “it’s a good program and I think it is a way to very authentically challenge students.” Participants felt the curriculum would be very useful and provide great hands-on lessons to implement within their classrooms (P1; P2; P3; P4; P5; P6 ;P9; P10 ; P12; P15; P16; P20; P21; P23; P24). In fact, most saw the curriculum as very helpful, P11 said, “I think within my classroom scope and sequence would flow better.”

**Negative Aspects.** Some participants were concerned about the structure of the program. P18 stated, “my perception of CASE is everything is very structured, like you will teach this lesson and then lesson and for me that doesn’t always work that way."

Participants were interested in the curriculum but were wary of the structured units. Another concern was utilizing all of the curriculum (P1; P5; P6; P8; P9; P19; P24; P25). P24 said, “I would stereotype we are all going to kind of teach are own our material and mold our curriculum to fit our program, so If I’m going spend a lot of money and not utilize all the materials associated with CASE I feel like it is a waste of money.”

**Barriers to Becoming CASE Certified**

**Cost.** Participants shared a common thought that the curriculum was good but cost prohibitive. In Nebraska there are currently scholarships available to cover the cost of attending CASE institutes which participants are aware of. P1 stated,

I just know in my school district it would be a pretty tough sell you go and get certified and now they would probably need to purchase some equipment, I’m sure that wouldn’t be as difficult if the training is paid for it yeah the initial step to get them to commit to that would probably be difficult.

When participants were asked if the scholarship would cover the cost of attending and the purchase of supplies, they all thought that would make it easier to attend a CASE institute. P8 stated, “I haven’t asked if my school would help foot the bill for some of those costs, my gut says not all of it, they may help with that but scholarships for that would be beneficial.”

**Time.** Participants all were concerned about the time needed to attend a CASE institute, which currently takes 50-100 hours of intense training. These concerns ranged from personal to professional issues with the amount of time needed to become CASE certified. Numerous participants were concerned about the time required to attend and being gone from their families (P2; P3; P5; P6; P8; P12; P13; P21; P22).

Participants were all interested in shortening the length of the CASE institutes by completing online preparation before start of an institute. The most common suggested time frame was 5 days to attend CASE with associated follow-up online activities. P13 stated, “Oh I think anything over 5 days of training is way too much.” When asked if a 5-day institute with pre-work done online would make attending a CASE training more feasible, P5 said, “Yeah that would probably be easier than you know taking the full time being away, it definitely would still be challenging and that but it would definitely be more feasible for sure.”

When participants were asked if administration support would influence their decision to become CASE certified, most thought their administration would be in support of becoming CASE certified (P2; P6; P7; P8; P9; P12; P13; P15; P16; P17; P21; P22; P23; P24).

Although some research participants thought it might help to have funds available for implementation of CASE. P8 stated, “if they saw from an administrator side or were told the benefits of CASE and encouraged it financially with some assistance I think it would help me.”

**Conclusions and Recommendations**

Teachers have varying perceptions of CASE, but most have a favorable perception of CASE. They identified multiple benefits of attending a CASE training including access to curriculum with hands-on labs and the possibility of offering science credit for agriculture classes. Knobloch, Ball, and Allen (2007) findings supported this by stating, “teachers believed that students benefited from laboratory activities, demonstrations, active learning environments that incorporate hands-on learning.”

Participants brought up the concern about how long it takes to become CASE certified (50-100 hours of intense training), which is usually 7-9 days with a weekend off. Participants were more receptive to becoming CASE certified if training could be reduced to five days with some required online pre-work before attending an institute. Although Balschweid & Thompson (2002) identified lack of in-service workshops or courses for learning how to integrate science into the curriculum as a barrier to integrating science, participant understand the need for training and admitted it would help them become more familiar with the material and labs. Based on findings of this study, it is our recommendation that the CASE institute be reduced to 5 days with incorporation of online preparation prior to attendance.

Participants also mentioned concern about cost of attending and utilizing the curriculum. In agreement with Balschweid & Thompson (2002), participants felt the lack of funding to support science integration was a barrier. While scholarships that would cover the cost of attending and implementing CASE would be well received, it may not be financially feasible to secure the funds for the scholarships or to sustain the funds over a period of time.

If school administration were aware that CASE courses can be offered for science credit, they may encourage more teachers to attend. Most participants believe their administration does not understand how CASE could benefit their schools. The benefits of the CASE curriculum need to be articulated to school administrators, so they might allocate funds for CASE. It is recommend that to share this information with administrators through the state department of education during administrator workshops. Additional research should be done to better understand administrators’ perceptions of CASE.

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**Literacy Integration Considerations of Secondary Agriculture Teachers**

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**Introduction and Literature Review**

Literacy skills are an important cornerstone of academic success (Pearson, 2013; Schmoker, 2011; Shanahan & Shanahan, 2008). Outside the classroom, they are needed to enter the workforce (Tannock, 2001) and to fully engage in everyday life (Gallagher, 2009; Moje, Young, Readence, & Moore, 2000; Peery, 2009). Each discipline has complex vocabulary and syntax (Fang, 2006; Fisher & Frey, 2009), unique communication expectations (Adams & Pegg, 2012), and a specific text interaction style (Lesley, 2014). Without instruction and opportunities to practice literacy skills in the discipline, students struggle to fully engage in the content and learning experience (Buehl, 2011).

Pre-service teachers are especially reluctant to include literacy in their classrooms (Buehl, 2011; Hall, 2005; O'Brien & Stewart, 1990; Spitler, 2011). Pre-service agriculture teachers are the most resistant to the idea of literacy integration (O'Brien & Stewart, 1990). However, in-service agriculture teachers have generally positive attitudes regarding literacy and its role in the agriculture classroom (Hasselquist & Kitchel, 2016) and use a wide variety of literacy activities in their classrooms (Hasselquist & Kitchel, 2016; Park & Osborne, 2006). Other content areas have documented similar attitudinal shifts between pre-service and in-service (Spitler, 2011).

When teachers enter the classroom, they rely heavily on the apprenticeship of observation to guide their practice (Eraut, 1994; Hammerness et al., 2005; Shulman, 1990), and focus on teacher-centered concerns (Darling-Hammond & Bransford, 2005). Eventually, they begin to focus on student-centered concerns, which helps them understand the complexities of teaching and leads them to seek out new ways to support learning (Hammerness et al., 2005), possibly through literacy integration. To better understand what causes the change in attitudes, we must explore how and why agriculture teachers choose to integrate literacy into their classrooms.

**Purpose and Research Question**

The purpose of this study was to conceptualize how teacher beliefs and experiences related to literacy translate into classroom practices. The central question which guided the study was: How do agriculture teachers become teachers of literacy?

The central question aligns with Priority #5 of the National Research Agenda: Efficient and Effective Agricultural Education Programs (Roberts, Harder, Brashears, 2016). Effective programs help support broader school initiatives, including improving students’ literacy skills.

**Methods**

The data analyzed for this study were part of a larger dataset exploring the process of literacy integration in agriculture classrooms. Many of the methods will be consistent or identical to the larger study. Grounded theory was selected due its appropriateness in exploring an unidentified process (Corbin & Strauss, 2015). Due to the scope of the project and submission limitations, the findings are explored as themes and no substantive theory is presented.

The population for this study were high school agriculture teachers with a minimum of five years teaching experience and a reputation for classroom literacy integration. A list of 13 potential participants was obtained from Missouri Department of Elementary and Secondary of Education, with only four males identified. All the males declined to participate or failed to responded to numerous calls, emails, and texts, limiting this study to only six female participants. Semi-structured face-to-face interviews were recorded and transcribed. Classroom observations, field notes, and artifact analysis informed the interviews. Open, axial, and selective coding were used to develop categories and themes (Corbin & Strauss, 2015). To ensure trustworthiness, memoing, data triangulation, constant comparative analysis, and member checking were used.

**Findings**

Four main themes emerged based on the information provided by the participants. The themes focused on considerations the participants kept in mind as they integrated literacy into their classrooms.

**Recognizing and Pushing Past Profession Norms and Expectations**

When reflecting on their experiences as secondary agriculture students and student teachers, all participants felt they had been exposed to very traditional programs with minimal literacy integration. Only Lea and Beth could remember literacy activities, and both were connected to career development events. Despite this background, all the participants believed and discussed how literacy was an important part of any successful agriculture program.

They also vocalized a frustration associated with other agriculture and career and technical education (CTE) teachers and their perceived lower academic expectations, including literacy, for their classrooms. Sue said, “I know there’s some Ag teachers that [do not use] literacy, they don’t do that kind of stuff because it’s not traditional.” While Lea reflected, “We can’t just pass the buck on [literacy] because we are CTE, which so many of us do.” They described how this attitude hurts students and the perceived willful ignorance of literacy and other academic concerns has negative effects for the entire field. Another concern the participants worked through was the perceived low expectations core teachers have regarding CTE classes.

**Career Growth and Maturity**

Purposeful literacy integration was a component of career growth and maturation. When recalling their first few years of teaching, participants described it as “survival mode.” Over time, participants became comfortable with technical content and confident in their teaching abilities. Beth said, “Once I got comfortable with content was when I could really make some changes.” When asked about including literacy Jane said, “Just be confident in yourself as a teacher. Confidence comes with time.” Participants also viewed confidence as an important aspect of resiliency, which is needed for literacy integration. As Jane said, “So [add literacy]. Fail. And that’s great, now learn how to do it better next time.” Time in the classroom allowed participants to build the necessary knowledge and skills for literacy integration.

The participants’ shift from teacher-centered to student-centered concerns, was crucial for literacy implementation. Time in the classroom allowed participants to become aware of students’ individual needs. During the early years of their careers, participants described a growing awareness of students’ struggles with literacy. Amy said, “probably about three to four years into my career you really start to see, ‘gosh this is terrible.’” For Lea, her awareness came out of frustration. “There was a huge gap for me as far as what I expected from kids and what I got,” she said. This awareness was important to identify what the students need and how to support them.

**Purposeful and Planning**

When incorporating literacy into their classrooms, participants described a planning process which did not focus specifically on literacy, but it was often added to enhance their lessons. Technical content was top priority for all participants. Sue said, “I am going to start with my objectives and I want them to know and then I come up with strategies that get them to the point.” Focusing on technical content gave the teachers are starting point for their lesson planning. They also considered other types of pedagogical strategies they had used before to add some variety to their instructional practices. Jane said, “We had lecture for three days and two days of hands on stuff so I was ready to do something more literacy based . . . It makes me and them more engaged when you switch it up.” They recognized literacy’s role in helping student learn curriculum and engage with the content.

Once they decided to include literacy, they discussed how it was their personal knowledge and relationships with their students that allowed them to identify what specific literacy activities to include. Lea shared, “I know what works for my kids because I have a relationship with them, so I understand how they are going to process information.” Sometimes they considered classroom dynamics when selecting the literacy activity. Amy described it as, “each class dynamic is a little different. . . I’ll be like, ‘I think I can get away with that in this class, but definitely not this class.’ So you make adjustments.” They all discussed finding subtle ways to include the literacy activities so it felt like an authentic fit to the students.

**Using Literacy to Enhance FFA and SAE Activities**

Literacy integration was not limited to the classroom. Several participants found ways to use literacy across the three-circle model. In the past, Sue’s FFA chapter had participated in Food for America. She recently changed from a petting zoo to a book based event. She shared, “we used to do Food for America . . . but the lessons weren’t age appropriate. . . So now we pick a book to read [to the students] and then develop activities to go with it.” She recognized how literacy activities can help enhance an FFA chapter’s outreach.

Literacy skills are needed to complete FFA award applications and update SAE record books. All participants required students to keep SAE record books in the classroom and devoted time to their upkeep on a regular basis. Amy reflected on how it was so important to help younger students understand the terminology and develop the appropriate writing skills. “You have to be able to write to tell your story. You could have the best project in the world but that is not going anywhere if you can’t write about it,” she remarked. Amy discussed taking several days in class to help students understand how to read a record book prompt or application question and respond appropriately. Participants recognized the importance of helping students develop the literacy skills needed to complete FFA award applications and update SAE record books.

**Discussion**

Even though the participants were not exposed to literacy as students or student teachers, they felt it belonged in every classroom, an attitude more agriculture teachers are beginning to share (Hasselquist & Kitchel, 2016). Despite the long standing belief that literacy integration is counter to the hands-on nature of agricultural education (O'Brien & Stewart, 1990), the participants believed literacy was the key to enhancing hands-on learning. They understood literacy was necessary for their students to be successful in life and took the time to implement it in all their classes, even the traditional hands-on ones (e.g. agricultural mechanics). It is possible other CTE teachers approach and treat literacy in a similar manner, but little to no research exploring other CTE fields exists.

Integrating literacy did not happen automatically for the participants, it took time and classroom experience. As they moved out of the early career stage and into the experienced teacher stage, they had a better understanding of student learning, content, and pedagogy, which allowed them to reexamine their lessons (Hammerness et al., 2005). Time in the classroom provided participants with confidence in their own abilities and a deeper understanding of technical content (Darling-Hammond & Bransford, 2005). The teachers also described a growing awareness of students, student learning, and other student-related concerns. The directional shift from teacher-centered to student-centered concerns (Hammerness et al., 2005) was important for literacy integration. As they became comfortable and confident in their classrooms, it was much easier to integrate literacy (Hammerness et al., 2005). Future research should focus on how student-centered teaching approaches influence literacy integration. Is being prepared and comfortable with a student-driven learning environment part of the literacy integration process or does it have to precede it?

Content was always a priority for teachers (Darling-Hammond & Bransford, 2005). Once they decided what to teach, the decision to include literacy was based on the best way to teach the technical information. Since pedagogical content knowledge (PCK) is identified as the best way to teach technical content (Darling-Hammond & Bransford, 2005; Roberts & Kitchel, 2010), it could be argued having a wide knowledge of literacy activities and strategies is an important component of developing PCK. Several student factors informed participants’ use of literacy activities. As teachers shifted from a teacher-centered to student-centered concerns (Hammerness et al., 2005), they used their knowledge of individual students and classroom dynamics to inform literacy integration

Agricultural education is represented as a three-circle model, with the circles of classroom, FFA, and SAE intersecting and overlapping to maximize student learning (Phipps, Osborne, Dyer, & Ball, 2008). Using literacy in the classroom is standard practice for many agriculture teachers (Hasselquist & Kitchel, 2016); however, this was the first time teachers could articulate how literacy appears in other areas of the model. While they described a few instances, it is possible the use of literacy activities is higher in FFA and SAE than originally reported. Teachers may fail to recognize all the other ways literacy is found in the three-circle model. Further research should be conducted focusing on the types of literacy activities used in the context of FFA and SAE and what types of supports are needed. Support should be provided to in-service teachers on how to use literacy across the three-circle model.

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**Drivers of Practice and Literacy Integration Experiences of Secondary Agriculture Teachers**

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**Introduction and Literature Review**

For many teachers, literacy is fundamental to classroom instruction (Schmoker, 2011). Acquiring new information from lectures, textbooks, and other sources of texts (Buehl, 2011; E Moje, Young, Readence, & Moore, 2000), engaging in group discussions or preparing written reports (Schmoker, 2011) are just a few ways students use literacy skills in the secondary classroom. Beyond the classroom, literacy skills are needed to be fully engaged in daily life (Buehl, 2011). Despite its importance for success in and out of the classroom, very few content area teachers focus on helping secondary students develop literacy skills (Pearson, 2013). Students view each class (math, science, etc.) as its own separate entity, and fail to transfer literacy skills learned in one class to the next (Moje, 1996). Without a reminder about how to approach text in content area classes, students may struggle.

It is not entirely known what leads agriculture teachers to integrate literacy. Literature states agriculture teachers have generally positive attitudes regarding literacy and its place in agricultural education (Hasselquist & Kitchel, 2016b), but it does not lead to higher implementation rates (Hall, 2005; Hasselquist & Kitchel, 2016a; Park & Osborne, 2006b).

A majority of agriculture teachers use literacy on a regular basis (Hasselquist & Kitchel, 2016b).

Park and Osborne (2007) found only 39.2% of agriculture teachers had completed college coursework related to content area literacy. Individuals who have completed literacy-related coursework used more strategies when compared to non-completers (Park & Osborne, 2006a). However, coursework was not influential in how often literacy activities are used (Hasselquist & Kitchel, 2016a).

**Purpose and Research Question**

The purpose of this study was to conceptualize how teacher beliefs and experiences related to literacy translate into classroom practices. The central question that guided the study was: How do agriculture teachers become teachers of literacy?

**Methods**

The data analyzed for this study were part of a larger dataset exploring the process of literacy integration in agriculture classrooms. Many of the methods will be consistent or identical to the larger study. Since the central question explored an unidentified process, grounded theory was selected (Corbin & Strauss, 2015). Due to the scope of the project and submission limitations, the findings are explored as themes and no substantive theory is presented.

The population for this study were high school agriculture teachers who had at least five years of teaching experience and were known for regularly implementing literacy in their classrooms. A list of 13 potential participants was obtained from Missouri Department of Elementary and Secondary of Education, with six agreeing to participate. It is important to note of the original participant list, only four males were identified. Special recruitment efforts were made but were unsuccessful. Semi-structured face-to-face interviews were recorded and transcribed and served as the primary data source. Classroom observations, field notes, and artifact analysis served as secondary sources. Artifacts collected included lesson plans and literacy materials used in the classroom. Data were approached with a pragmatist epistemological lens, which is appropriate for grounded theory (Corbin & Strauss, 2015). Open, axial, and selective coding were used to develop categories and themes (Corbin & Strauss, 2015). Trustworthiness was established through extensive memoing, data triangulation, constant comparative analysis, and member checking (Creswell, 2013).

**Findings**

Several themes emerged as relevant to the central question. Teachers identified several drivers of practice which motivated them to include literacy and other related experiences they encountered while incorporating literacy.

**Belief Drivers of Practice**

Literacy incorporation was driven by participant beliefs, which explained why they choose to use literacy and what they hoped to achieve. They often linked literacy skills with student successful outside of the high school agriculture classroom. Stevie believed, “if you can’t read, you can’t do anything.” Lea said, “If I’m going to set my students up for success in the [workplace], then they have to be literate.” They also believed literacy integration in agriculture classrooms was an important means of student transfer. Lea said, “If I don’t expect them to do [use literacy skills] here, then they’re going to think it’s an English [thing], not something they should be doing all the time.” Stevie discussed the importance of multiple exposures. “If . . . we don’t put [literacy] into each block every day, it’s not gonna (sic) stick.” They believed when all teachers included literacy, the additional exposure benefitted students.

Literacy integration was not always driven by student needs. Sometimes, “including literacy is just part of good teaching,” as Sue pointed out. The participants believed integrating some literacy practices into their lessons was the best to communicate technical content. Beth believed literacy is a “tool” she uses on a regular place. She said, “I [use it] to get [content] across to my students . . . it just happens.” The use of literacy in practical real-life ways important for the participants. Jane described how literacy integration must be subtle and have real life applications. “If [it’s] just thrown in there [the students] know and it will not go well,” she reflected. They worked to replicated text sources and mimic ways students will encounter literacy outside the classroom.

**Common Struggles Faced**

When trying to integrate more literacy, they often expressed frustration at their lack of literacy-related resources and personal literacy knowledge. Stevie said, “I don’t always feel equipped because when I went to college, you had one reading class . . .” Lack of time was another concern expressed by participants. Some discussed the volume workload. Beth said, “Sometimes you’re just going to stick with what you’ve been doing because you know it works instead of implementing something new. I don’t have time.”

Participants also described how certain aspects of the school setting can make integration difficult. The physical location of the agriculture programs resulted in pseudo-isolation for the rest staff. Sue described how being in a separate building had a negative impact. She shared, “I don’t see [other teachers] in the hallways . . . [we are not] getting ideas or sharing stuff . . .” She felt the face-to-face contact was important for literacy integration. All participants taught in a district with a literacy initiative and had attended district sponsored professional development. They described it as mediocre at best and not meeting their needs.

**Sustaining Experiences**

Despite the challenges of literacy integration, the participants identified several experiences which helped maintain and sustain them throughout the process. All the participant eagerly identified themselves as readers and enjoyed reading in their free time. Two participants, Stevie and Sue, described how their previous struggles with literacy motivated them to include literacy with their students. Amy was influenced by watching her grandfather. She said, “my grandpa was a farmer his entire life but he still had his stack of farm magazines sitting beside his chair.”

Undergraduate coursework also provided participants with knowledge and experience to help them in the literacy integration process. Only three participants took a literacy specific undergraduate course, with mixed results. Beth and Jane had agricultural education professors who embedded literacy strategies and activities into their methods course. Both benefited from seeing literacy in the context of an agriculture classroom. Jane said, “we would do something and [the professor] would be like, ‘by the way, this is a good way to incorporate reading into your lessons.’ . . . it was constant.” The professors sent the message literacy was an important part of the content area.

**Support Structures Used**

After deciding to include literacy, the participants sought out a variety of support structures to help them in the process. One of the first steps was to reach out to other agriculture teachers through face-to-face and electronic means. Beth shared, “I always enjoy [seeing] specific things other ag teachers are doing that I can implement in my room.” Several participants discussed the importance of accessing the National Association of Agricultural Educator’s (NAAE) Communities of Practice. Lea said, “I look on Pinterest sometimes, but probably [NAAE’s] Communities of Practice is the best.”

Two participants, Stevie and Sue were fortunate enough to work in districts with a sustained and supported literacy initiative. Sue had a literacy coach who worked with all teachers in the building. “With [the literacy coach] we did all kinds of teaching strategies. . . ,” she stated. She discussed how having a literacy coach helped her develop and provided ideas to use in her classroom. Stevie’s school districts started a Professional Learning Community (PLC) with the focus of improving every student’s reading ability. She credits the PLC with empowering her to help all students.

Participants actively sought and developed a literacy integration community of practice within their building. For Stevie, when she wanted to include more literacy she asks her peers. She said, “I asked three [core subject area] teacher I felt had good ideas because I had been in their classrooms . . . [I learned] simple things to make learning click for kids.” For Sue, it was important to watch how other teachers included literacy. She felt the more she was exposed to it, the better she could implement it in her classroom. She added, “I learned how to teach from [my peers].” For all participants, their community of practice enhanced their literacy integration.

**Discussion**

The participants believed literacy skill development was the responsibility of all teachers, which aligns with current research (Hasselquist & Kitchel, 2016b). Participants hoped by including literacy in their classrooms they could begin to improve students’ literacy skills and help them realize how literacy is integrated into society. People use literacy in their professional and personal lives (Buehl, 2011) and participants wanted their students to recognize its role in life outside of high school. They believed in the practical, purposeful, yet subtle incorporation of literacy into their agriculture classrooms.

With time being a limited resource for teachers (Baker et al., 2008; Eraut, 1994; Shulman, 1988; Shulman, 1987), participants reported prioritizing other obligations over the need to find literacy activities and texts. Participants expressed concern about not having time find new strategies and activities. They relied heavily on other teachers with literacy related experience (Putnam & Borko, 2000; Shulman, 1988; Shulman & Shulman, 2004). To accommodate for limited time, pre-service programs should equip students with several simple strategies that can be adapted to a variety of settings. In-service teachers would benefit from a clearinghouse containing Career and Technical Education (CTE) appropriate activities and strategies. The potential of aggregating literacy activities on NAAE’s Communities of Practice could be explored to maximize teachers’ time and resources.

All participants taught in a school with a literacy initiative, which is common among agriculture teachers (Hasselquist & Kitchel, 2016b). In the past, agriculture teachers felt pressured to include literacy when working a district with a stated literacy initiative ( Park & Osborne, 2006a). However, Sue and Stevie enjoyed being part of sustained and supported literacy programs and did not feel pressured. Literacy inclusion emerged organically because of the supportive environment. Future research should explore what aspects of the sustained and supported environment allowed them become literacy supporters and how that experience can be replicated for other teachers.

A teacher’s personal literacy experiences cannot be discounted (Hall, 2005). Personal struggles informed how they approached literacy with their students. For participants who completed literacy-related coursework, the instructor’s approach influenced how the class was perceived. Facilitators have a large impact on professional development programs (Borko, 2004), the same argument could be made concerning course instructors. For participants, the most effective literacy instructors approached reading from a secondary perspective. Agricultural education faculty should work to embed literacy into their classes to help students what literacy integration looks like in the context of agricultural education.

Communities of practice were developed in response to students’ literacy needs. Participants partnered with core academic teachers to help improve their practice (Darling-Hammond & Richardson, 2009; Desimone, Porter, Garet, Yoon, & Birman, 2002; Garet, Porter, Desimone, Birman, & Yoon, 2001), typically including an English or Language Arts (ELA) teacher. All participants reported gaining activities and ideas from fellow teachers, many of which contained aspects of literacy. Little is known about how agriculture teachers form their communities of practice outside professional development. This type of networking behavior may be common for other types of teacher concerns (e.g. classroom management); however, we do not know. Future research should be conducted to determine in what other concerns drive agriculture teachers to develop communities of practice. For pre-service teachers, special consideration should be given to restructuring general teacher education classes to promote collaboration among the content areas by providing students the opportunity to work with other pre-service teachers.

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**Concurrent Session C**

**Room: Farm Credit Services of America Classroom**

**Session Theme: Secondary Ag Ed Programs**

**Discussant: Neil Knobloch, Purdue University**

**Facilitator: Gaea Hock, Kansas State University**

**School District Superintendents’ and Attorneys’ Perceptions of the Most Important Educational Law Issues Impacting the Professional Security of Agricultural Science Teachers**

Mark Hainline, Scott Burris, Rudy Ritz, Jonathan Ulmer

**The Influence of Social Support on Teacher Self-Efficacy in Novice Agricultural Education Teachers**

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**A Comparison of School Based Agricultural Education Students’ Psychological Needs**

Amanda Bowling, Anna Ball

**School District Superintendents’ and Attorneys’ Perceptions of the Most Important Educational Law Issues Impacting the Professional Security of Agricultural Science Teachers**

Mark S. Hainline, Iowa State University

Scott Burris, Texas Tech University

Rudy Ritz, Texas Tech University

Jonathan Ulmer, Kansas State University

**Introduction**

Teachers are tasked with the important role of educating and empowering the Nation’s youth. The field of education can be a rewarding profession, but teachers are subjected to risks and liabilities daily. The litigious manner of society today, coupled with the perpetually changing nature of laws and regulations, has inundated public schools with legal problems caused by legislation and litigation (Imber & Gayler, 1988). More specifically, factors such as the lack of teacher training (Schimmel & Militello, 2007), the increase of special education mandates (Leonard, 2007), courts’ increased recognition of teacher and student rights (Lupini & Zirkel, 2003), and the increase of state and federal legislation (Koch, 1997) have been noted as contributing factors to the increase of school-based litigation.

Paul (2001) stated “teachers ignore or remain ignorant of the law at their own peril, endangering their professional careers and their reputations” (p. 178). Hence, it is imperative teachers have a working knowledge of current laws and regulations and are cognizant of ongoing augmentations to school law.

Along with the general liabilities faced by educators, agricultural science teachers are exposed to additional liabilities due to their unique professional responsibilities, such as supervising students in a laboratory setting (Dyer & Andreasen, 1999) or chaperoning overnight trips (Greene, 1998). To better prepare teachers to work in the present litigious environment, educational law training (i.e., pre-service and in-service) is needed on contemporary issues. Therefore, this study sought to determine the important educational law issues, which pose the greatest threat to Texas Agricultural Science Teachers, based on the perceptions of school district superintendents and attorneys in Texas.

**Theoretical Framework**

This research study was guided by the Protection Motivation Theory (PMT) (Rogers, 1983) which evaluates how individuals process and cope with threats. The PMT is comprised of three distinct components: sources of information, cognitive mediation processes (i.e. threat appraisal process & coping appraisal process), and coping modes (i.e., adaptive or maladaptive coping) (Crossler, 2010; see Figure 1).

According to Floyd, Prentice‐Dunn, and Rogers (2000), of the two cognitive mediating processes, individuals engage in the threat appraisal process first because they must identify and assess a threat before selecting appropriate coping options to mitigate the threat. When an individual perceives a threat to be severe and feels vulnerable, they are more likely to consider factors (i.e., response efficacy, self-efficacy, and cost of adaptive behavior) of the coping processes to mitigate a threat (Floyd et al., 2000). The two cognitive mediation processes (i.e., coping and threat appraisal processes) are mediated by protection motivation, which is the individual’s intention to perform adaptive coping behaviors (to protect themselves or others) or maladaptive coping behaviors (not to protect themselves or others) (Crossler, 2010; Milne, Sheeran, & Orbell, 2000).

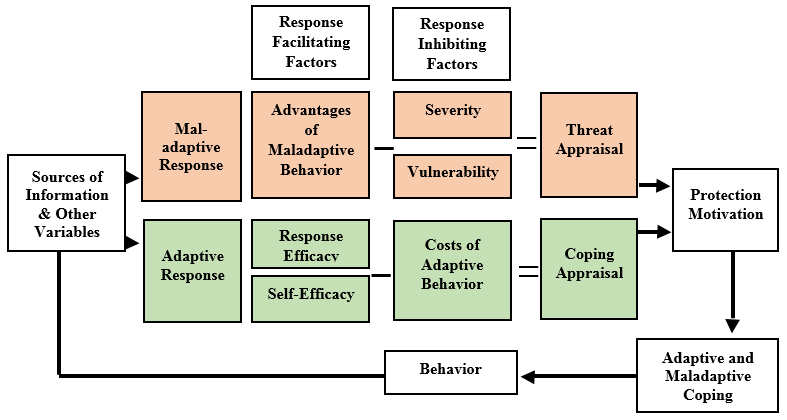


Figure 1. Schematic Representation of Protection Motivation Theory (Rogers, 1983)

Sources of information serve as the catalyst to propel an individual to engage in the cognitive mediating processes. The educational law issues, gathered in this Delphi study, will serve as sources of information for subsequent studies, examining how Texas Agricultural Science Teachers process educational law threats.

**Purpose/Objectives**

The purpose of this Delphi study was to identify important educational law topics which present risk to the professional security of Texas Agricultural Science Teachers. The following objectives guided this Delphi study:

1. Identify important general education law topics for Texas Agricultural Science Teachers.
2. Identify important educational law topics specific to the field of agricultural education for Texas Agricultural Science Teachers.

**Methods/Procedures**

A three-round Delphi method was used to obtain a consensus among experts on the most important educational law issues for agricultural science teachers. Constructed by a snowball sampling technique, the panel (*n* = 20) included Texas school district superintendents and attorneys. All superintendents (*n* = 11) were former agricultural science teachers. The attorneys (*n* = 9) represented school districts with agricultural science programs. The panel size was analogous to a multitude of previous Delphi studies (Brungs & Jamieson, 2005; Keil, Tiwana, & Bush, 2002).

Three instruments were used in the research study, one for each round. The initial instrument consisted of two open-ended questions:

* What legal issues (in general) are most relevant for teachers today?
* What legal issues (specifically related to agricultural education) are most relevant for teachers today?

Responses from the open-ended instrument were reviewed and duplicate responses were consolidated, resulting in the identification of 52 unique educational law topics. The second-round instrument was developed using the individual items that resulted from round one. Each item was coupled with a four-point scale (1 = *Not Important*; 4 = *Extremely Important*), inquiring about the level of importance the panel members associated with the issue.

Similar to the consensus criteria used in previous agricultural education Delphi studies (Lundry, Ramsey, Edwards, & Robinson, 2015; Ramsey, 2009), items which received a score of 3 (*Important*) or 4 (*Extremely Important*) from at least 75% of the experts were considered to have met consensus. Items which received a score of 3 or 4 by 51% to 74% of the experts were presented on the third-round instrument for reexamination. Issues which received less than 51% agreement of importance were excluded from further consideration.

All three rounds of the Delphi were constructed and distributed on the Qualtrics online survey platform. The content validity of the instruments were assessed by a panel of agricultural education and educational law experts (*n* = 6), and the concurrent validity of the Delphi study was bolstered by way of the three-round Delphi technique (Hasson, Keeney, & McKenna, 2000). The reliability of the Delphi instruments was assumed based on recommendations of Dalkey, Rourke, Lewis, & Snyder (1972), which stated the inclusion of 13 Delphi panel experts yielded a reliability with a correlation coefficient of .90. The data was transferred to IBM® SPSS® (Version 22) for data analysis.

**Findings/Results**

After round one, 131 educational law issues were garnered from the 20 school district attorneys and superintendents. Eighty-two educational law topics were indicated for the first question, *what legal issues (in general) are most relevant for teachers today?* Forty-nine topics were provided for the second question, *what legal issues (specifically related to agricultural education) are most relevant for teachers today?*

Responses to round one were examined, and duplicate responses were eliminated or combined. Of the 131 original topics, 52 were retained for examination in the second round. Thirty-three of the final 52 topics addressed the general legal issues facing teachers (i.e., question one), and the remaining 19 were issues related to agricultural education issues (i.e., question two).

Then, the educational law topics were grouped into seven categories (i.e., student discipline, student safety/supervision, teacher communication, special education, teacher rights, liabilities of teachers, and teacher’s duty to report), based on the main areas of educational law predicated by Walsh, Kemerer, and Maniotis (2014). Fourteen school district superintendents and attorneys responded to the second-round instrument (70% response rate).

The panel of experts reached consensus (i.e., received a score of 3 (*Important*) or 4 (*Extremely Important*) by 75% or more of experts) on 31 topics in round two, 16 items related to the first question, and 15 pertaining to question two (see Table 1).

|  |  |  |
| --- | --- | --- |
| Table 1 | | |
| *Round Two and Three Findings: Important Law-Based Topics Related to General Education and Agricultural Education* | | |
| Educational Law Topic | Category | %c |
| Inappropriate communication with parents and students via text messaging.a | General | 100 |
| Inappropriate contact between educators and students (verbal, physical, & on social media). a | General | 100 |
| Student discipline in school. a | General | 100 |
| Supervising students on an overnight stay (providing proper supervision when students are “out of view”). a | Ag. Ed. | 100 |
| Communication with parents.a | Ag. Ed. | 92.9 |
| Complying with special education mandates (IEPs).a | General | 92.9 |
| Financial literacy among teaches regarding proper management/handling of money (fundraising, budget, and public funds).a | Ag. Ed. | 92.9 |
| Proper accommodation and modification of curriculum for students with disabilities. a | General | 92.9 |
| Properly dealing with students’ behavioral issues (BIPs).a | General | 92.9 |
| Student risk assessment in activities.a | Ag. Ed. | 92.9 |
| Student safety in the agricultural mechanics shop.a | Ag. Ed. | 92.9 |
| Student safety in the agricultural science classroom.a | Ag. Ed. | 92.9 |
| Student supervision at extracurricular events (CDEs or convention).a | Ag. Ed. | 92.9 |
| Student transportation (in school or personal vehicles).a | Ag. Ed. | 92.9 |
| Teacher contract rights.a | General | 92.9 |
| Understanding teacher employment contracts and compensation.a | General | 92.9 |
| Communication with supervisors and administrators.a | Ag. Ed. | 92.3 |
| Educator code of ethics.a | General | 85.7 |
| Liabilities associated with the handling of livestock animals (on and off-campus).a | Ag. Ed. | 85.7 |
| Sexual harassment.a | General | 85.7 |
| Student code of conduct (at school and on extracurricular events).a | Ag. Ed. | 85.7 |
| Student confidentiality (FERPA).a | General | 85.7 |
| Student discipline on extracurricular activities.a | Ag. Ed. | 85.7 |
| Student safety at school farm.a | Ag. Ed. | 85.7 |
| Student supervision at livestock shows a | Ag. Ed. | 85.7 |
| Dealing with booster club/support organizations.b | Ag. Ed. | 84.6 |
| Operating and maintaining a motorized vehicle.b | Ag. Ed. | 84.6 |
| Educational Law Topic | Category | %c |
| Bullying.a | General | 78.5 |
| Duty to report suspected child abuse and neglect under state law.a | General | 78.5 |
| Harassment issues (includes employee-to-student and student-to-student harassment).a | General | 78.5 |
| Statutory immunity issues under state law. a | Ag. Ed. | 78.5 |
| Title IX complaints.a | General | 78.5 |
| Understanding school district/board policy.a | General | 78.5 |
| Liability of dealing with hostile and empowered students.b | General | 76.9 |
| Supplemental duties as an extracurricular sponsor.b | Ag. Ed. | 76.9 |
| *Note*. aConsensus reached in round two. bConsensus reached in round three. c Percent of Expert Agreement. | | |

In the third round, participants (*n* = 14, 92.8% response rate) were asked to evaluate ten items from the second round which received a score of 3 (*Important*) or 4 (*Extremely Important*) by 51% to 74% of the participants. Using the same consensus threshold used in round two, the experts reached consensus on four additional items (one pertaining to question one and three regarding question two) in the third round. Overall, a total of 35 educational law topics reached consensus of importance after the three rounds of the Delphi were finalized.

**Conclusions, Implications, Recommendations**

The general educational law issues which reached consensus were associated with teacher rights, student discipline, special education, and teacher communication categories (Walsh et al., 2014). Although, these educational law topics are not exclusively related to agricultural science teachers, they have the potential to pose a threat to the professional security of these teachers. A narrow focus on educational law issues solely in an agricultural education context would neglect to examine important issues agricultural science teachers face as classroom instructors.

Objective two sought to identify important educational law topics related to agricultural education. The topics which reached consensus were related to educational law categories of student safety, student supervision, communication with superiors and parents, and financial responsibility (Walsh et al., 2014).

The experts indicated high agreement on the importance of issues related to the safety and supervision of students. It is likely that concern for student safety is intensified due to the inquiry-based learning which occurs in classrooms, horticultural facilities, agricultural mechanics shops, school farms, and other off-campus locations. This implication is supported by Dyer and Andreasen (1999), who suggested laboratories are potentially hazardous places for both work and study. Further, taking students on extracurricular trips poses a special concern for teachers in terms of student safety (Greene, 1998).

Due to the perpetually changing nature of local, state, and federal laws and policies, the importance of educational law issues will continue to change. Mirabile (2013) indicated the need for a systematic method for keeping pace with changes in the law, due to the influence of legislation on education. Therefore, periodic studies should be conducted to stay abreast of important educational law issues. Educational laws vary from state-to-state; hence the findings are limited to Texas teachers. Subsequent studies should be conducted in other states to identify important state-specific educational law issues.

The experts’ opinions constitute sources of information, serving as the genesis for evaluating teachers’ protection motivation (Rogers, 1983) towards educational law issues. Conducting educational law needs assessments on agricultural science teachers will provide insight on the teachers’ cognitive mediating processes.

Texas Agricultural Science Teachers must achieve a working knowledge of district policies, state torts, federal laws, and Supreme Court decisions. When an issue arises, teachers should consult knowledgeable superiors before making uniformed decisions (Greene, 1998). Knowledge of these issues will assist teachers in avoiding liabilities, and will safeguard teachers against infringements on their rights.

School administrators can also play an instrumental role in the enrichment of teacher’s educational law knowledge. To assist in this effort, administrators could potentially include aspects of educational law training during in-service. School administrators should collaborate with district legal staff to assist in the development and implantation of educational law trainings.

The unique agricultural education-related issues (e.g., student supervision at livestock shows), identified by the experts, implies the need for a specialized training for agricultural science teachers. Teacher educators and professional development leaders of the VATAT should collaborate to train agricultural science teachers about important educational law issues. This collaboration could potentially encompass the development of pre-service educational law courses and the implementation of educational law professional development events for Texas Agricultural Science Teachers.

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**The Influence of Social Support on Teacher Self-Efficacy in   
Novice Agricultural Education Teachers**

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Jon C. Simonsen, University of Missouri

**Introduction/Literature Review**

According to Ingersoll (2012), an estimated 40% to 50% of teachers leave the profession within the first five years of teaching. Thus, researchers in education, business, and psychology have studied teacher retention, employee turnover, and career commitment for decades (Blau, 1988; Goulet & Singh, 2002; Knobloch & Whittington, 2003). Support, particularly from supervisors and colleagues, positively influences career commitment, job satisfaction, and self-efficacy (Jensen, Patel, & Messersmith, 2013; Stockard & Lehman, 2004).

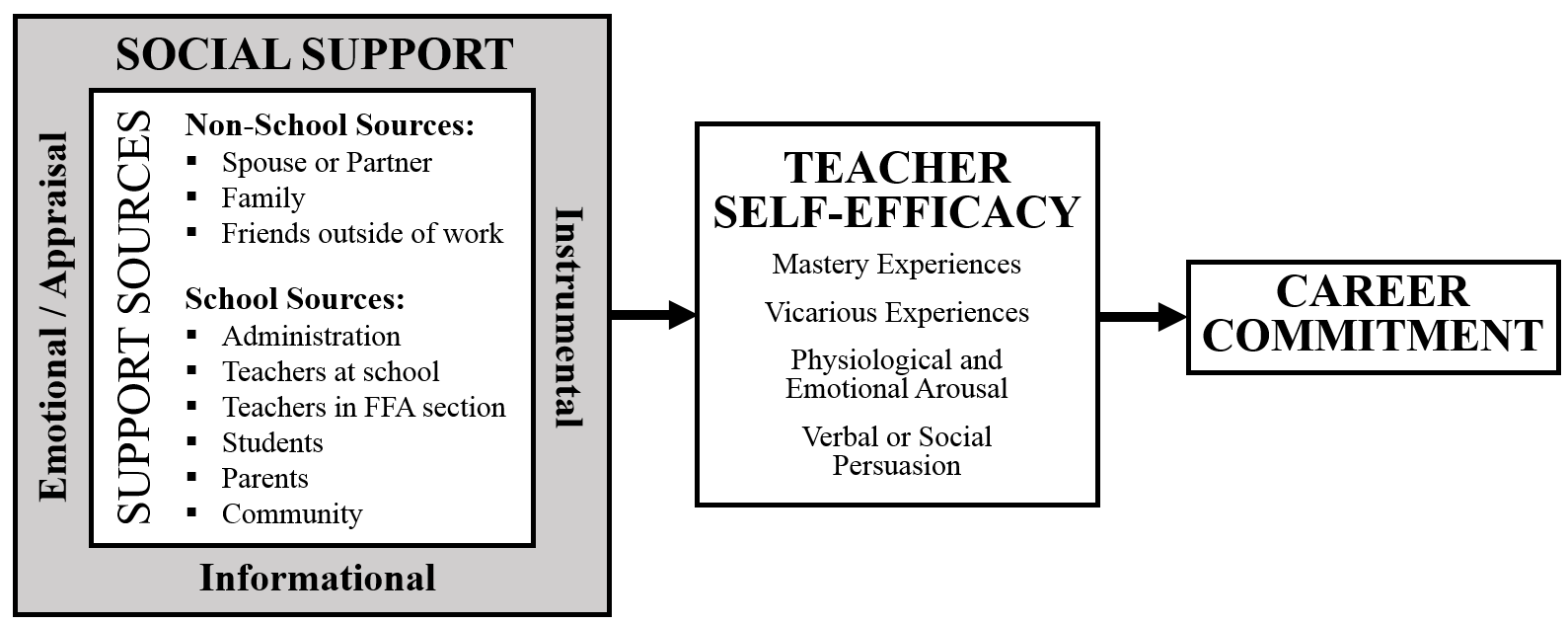
Teacher self-efficacy is the belief that one is capable of bringing about desired outcomes of student engagement and learning, regardless of how difficult or unmotivated the students may be (Tschannen-Moran & Woolfolk Hoy, 2001). The described teacher self-efficacy is linked to career commitment and retention, teacher quality, student achievement, and job satisfaction (Bandura, 1993; Bandura, 1997; Hancock & Scherff, 2010; Kelly & Northrop, 2015; Sorensen & McKim, 2014). Furthermore, low teacher self-efficacy is a primary reason teachers choose to leave education (Knobloch & Whittington, 2002; McKim & Velez, 2015; Swan, Wolf, & Cano, 2011; Tschannen-Moran & Woolfolk Hoy, 2007). Thus, teachers who possess high levels of self-efficacy are more likely to remain in the profession and those with low levels of self-efficacy may leave.

Novice teachers, those with less than five years of experience, are most likely to experience the negative consequences of low self-efficacy (Brown, Lee, & Collins, 2014; Woolfolk Hoy, 2000). Researchers postulate this may be a result of reality shock (Corbell, Reiman, & Nietfeld, 2008; Kelly & Northrup, 2015), or the removal of accessible support after student teaching (Knobloch & Whittington, 2002; Roberts, Harlin, & Ricketts, 2006; Stripling, Ricketts, Roberts, & Harlin, 2008). “[Teachers] leave for many reasons, but lack of support is at the top of the list” (Carroll, 2005, p. 199).

In an effort to build a support network which will enhance career commitment while improving teacher self-efficacy, it is essential to identify the *sources* and *types* of support which are most beneficial for novice teachers. The benefits of social support have been extensively studied in medicine and psychology, but limited research has been completed in education to evaluate the ways in which social support influences teacher self-efficacy and subsequent effects on teacher retention and career commitment. Thus, with an increase in teacher attrition and decline in career commitment for novice teachers contributing toward the nationwide shortage of qualified agricultural education teachers (Kantrovich, 2010), it is essential to understand the role support plays with novice teachers. This research inquiry furthers the knowledge around psychological support and aligns to the AAAE National Research Agenda, Priority 3, by exploring the models and effective practices to support the success of agricultural education teachers at all stages of their careers (Stripling & Ricketts, 2016).

**Theoretical/Conceptual Framework**

The theoretical framework for this study was derived from theories on social support (Cohen & Wills, 1985) and outcome-expectancy (Bandura, 1997). This research, combined with findings on social support constructs (House, 1981) and teacher self-efficacy (Tschannen-Moran & Woolfolk Hoy, 2001), served as the foundation for the conceptual framework in this study. As shown in Figure 1, social support can either be perceived as available or received in the forms of *emotional/appraisal* support, *informational* support, or *instrumental* support (Cohen & Hoberman, 1983; Heaney & Israel, 2008; House, 1981; House & Wells, 1978). Support may come from *school* (i.e., work) sources – administrators, teachers, students, parents, or community (House & Wells, 1978; Knobloch & Whittington, 2002; Tschannen-Moran & Woolfolk Hoy, 2007) – or *non-school* (i.e., personal) sources – spouse or partner, family, or friends outside of work (Bataineh, 2009; Cornu, 2013; Fantilli & McDougall, 2009). Along with other variables, the support a novice teacher may receive or perceive as available influences his or her perceived level of teacher self-efficacy (Tschannen-Moran & Woolfolk Hoy, 2001); teacher self-efficacy is a predictor of one’s psychological commitment to a career (Burke, Aubusson, Schuck, Buchanan, & Prescott, 2015; DeAngelis, Wall, & Che, 2013; Devos, Dupriez, & Paquay, 2012; Maistre & Pare, 2010).



*Figure 1.* Constructs and Variables in the Current Study

**Purpose and Objectives**

The purpose of this descriptive-relational study was to determine the degree of social support novice agricultural education teachers perceive from various sources and types of social support, along with the influence of perceived support on novice teacher self-efficacy. The following research objectives guided the study.

1. Determine the degree of support novice agricultural education teachers perceive   
   as available from *non-school sources* and *school sources* of support.
2. Determine the *types* of social support which novice agricultural education teachers perceive as available.
3. Describe the perceived level of *teacher self-efficacy* in novice agricultural   
   education teachers.
4. Describe the contribution of perceived support from *non-school sources* and *school* *sources* towards *teacher self-efficacy* in novice agricultural education teachers.
5. Describe the contribution of the *types* of social support toward *teacher self-efficacy* in novice agricultural education teachers.

**Methods/Procedures**

This quantitative inquiry employed descriptive and inferential methods to address the contributions of perceived support on teacher self-efficacy in novice agricultural education teachers. The target population was novice teachers of agriculture from Illinois (*n* = 192) and Indiana (*n* = 104). Teachers’ perceptions of support from three non-school sources (e.g., spouse or partner, family, friends) and six school sources (e.g., administrators, teachers at school, teachers in FFA section or district, students, parents, community) of support within three support constructs (e.g., emotional/appraisal, informational, instrumental) were used to predict the contribution of social support on teacher self-efficacy.

The researcher collected 119 responses from agricultural education teachers with five or fewer years of teaching experience. A questionnaire was administered online and included three survey instruments – the *Social Support Scale* (developed by the researcher); the *Teachers’ Sense of Efficacy Scale (short form)* (Tschannen-Moran & Woolfolk Hoy, 2001); and *Career Commitment* (Hancock and Scherff, 2010). Participants responded to each survey item using a 9-point Likert-type scale. Anchors for the degree of perceived support were 1 = *never*, 3 *= rarely*, 5 *= sometimes*, 7 = *often*, and 9 = *always*.Anchors for the Likert-type scale assessing teacher self-efficacy were 1 = *nothing*, 3 *= very little*, 5 *= some influence*, 7 = *quite a bit*, and 9 = *a great deal*. Response options for the career commitment measure were 1 = *strongly disagree*, 2 = *disagree*, 3 = *somewhat disagree*, 4 = *neither agree nor disagree*, 5 = *somewhat agree,* 6 = *agree*, and 7 = *strongly agree*. Additionally, the questionnaire contained items relevant to demographic and work-related characteristics (e.g., years of teaching experience, gender, relationship status, type of teaching licensure, and grade level of students which respondents were responsible for teaching).

A panel of experts, consisting of four faculty from two universities who specialize in agricultural education and agricultural leadership education disciplines, reviewed and verified the face and content validity of the instrument. Results from the pilot test (*N* = 27) of the *Social Support Scale* reflected “excellent” internal consistency (Cronbach, 1951; Nunnally, 1978) for the *emotional/appraisal* construct (α = .96), *informational* construct (α = .92), and the *instrumental* construct (α = .95). Additionally, Cronbach’s alpha estimates of internal consistency for the three *non-school sources* of support ranged from .89 to .92, while the internal reliabilities for the six *school sources* of support ranged from .89 to .96. These reliability estimates exceeded the minimum coefficient threshold of .70 recommended by Nunnally (1978). The 12-item *Teachers’ Sense of Efficacy Scale* *(short form)* has been assessed for validity and reliability. Published reliabilities for the three constructs of this commercially available instrument range from .81 to .90. A one-item measure was used to assess career commitment. The survey item was modified from a question used by Hancock and Scherff (2010) wherein researchers used a dependent variable to measure attrition risk.

To address non-response error, the researcher used two methods recommended by Linder, Murphy, and Briers (2001). No statistically significant differences were found between early and late respondents for 12 of the 14 items assessed in the survey instrument using the *Comparison of Early to Late Respondents* method. To address concerns for the two remaining items (*future career plans* and *non-school sources of support*), the researcher used the “*Days to Respond” as a Regression Variable* method. After analyzing the results from the regression, the researcher determined the *non-school sources of support* variable to be a valid measurement, generalizable to the target population. The *future career plans* variable was not directly related to the research objectives of this study; therefore, the researcher chose to proceed with data analysis, but exercised some degree of caution when evaluating implications of the future career plans variable.

**Findings/Results**

The majority of respondents (*n* = 119) were female (68.9%) with three or fewer years of teaching experience (79.0%) who completed a traditional teacher licensure program (69.7%). The respondents represented the age and experience level of the population of agricultural education teachers in the two states. The majority of respondents (63.9%) selected *strongly agree* or *agree* when prompted to respond to a statement regarding future plans to teach (i.e., career commitment) in the next five years.

Descriptive statistics were calculated to determine (1) the degree of support novice teachers of agriculture perceived as available from three *non-school sources* and six *school sources* of support; (2) the *types* of support teachers perceived as available; and (3) teachers’ perceived level of teacher self-efficacy. Novice agricultural education teachers perceived support as *sometimes* available from *non-school* (*M* = 5.83, *SD* = 1.55) and *school* (*M* = 5.39, *SD* = 1.24) sources. Respondents determined *emotional/appraisal* support (*M* = 5.84, *SD* = 1.22) was the most available type of social support; their perceptions for each construct fell within the parameter of *sometimes* available. Furthermore, the overall mean of novice teachers’ perceived level of teacher self-efficacy (*M* = 6.57, *SD* = 0.96) indicated teachers perceived *quite a bit* of control in their efficacious beliefs for managing a classroom, engaging students, and using instructional practices.

To describe the contribution of perceived support from *non-school sources* and *school* *sources* towards *teacher self-efficacy* in novice agricultural education teachers, the researcher identified the outcome variable for the regression as the *overall mean of teacher self-efficacy*. As shown in Table 1, Model 3 of the regression was significant, *F* = 3.85(6,104, *p <* .05). When controlling for all other variables, demographic characteristics and future career plans contributed 7.0% (*adjusted* *R2* = .07) of the variance for teacher self-efficacy, while *school sources* of support contributed 25.3% (*adjusted* *R2* = .25) of the variance for teacher self-efficacy. The researcher determined differences in perceived support from *school sources* explained a significant (*p* < .05) proportion of variance in teacher self-efficacy in novice agricultural education teachers. Furthermore, individual assessment of Model 3 revealed three statistically significant (*p* < .05) covariates for teacher self-efficacy – *total years of teaching* (*p* = .01), perceived support from *students* (*p* = .00) and *community* (*p* = .02). Furthermore, novice teachers’ perceptions of support from *students* (*β* = 0.43) was four times more predictive of teacher self-efficacy than *future plans to teach* (*β* = 0.07), and twice as predictive as *total years of teaching* (*β* = 0.27). Similarly, perceived support from *community* (*β* = 0.34) was three times more predictive than *future plans to teach*, and nearly twice as predictive as *total years of teaching*.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Table 1 | | | | | | | | | | | | | | |
| *Forced Entry Multiple Linear Regression of Respondents’ Teacher Self-efficacy using Selected Demographic Characteristics and Perceptions of Support from School and Non-school Sources (n = 119)* | | | | | | | | | | | | | | |
|  | Model 1 | | | |  | Model 2 | | | |  | Model 3 | | | |
|  | *B* | *SE B* | *β* | *p\** |  | *B* | *SE B* | *β* | *p\** |  | *B* | *SE B* | *β* | *p\** |
| (Constant) | 6.19 | .52 |  | .00 |  | 5.53 | .64 |  | .00 |  | 4.87 | .65 |  | .00 |
| Total years teaching | .12 | .05 | .23 | .02 |  | .15 | .05 | .29 | .00 |  | .14 | .05 | .27 | .01 |
| Future plans to teach | .10 | .04 | .22 | .02 |  | .09 | .04 | .21 | .02 |  | .03 | .04 | .07 | .41 |
| Gender | -.27 | .19 | -.13 | .16 |  | -.23 | .19 | -.11 | .23 |  | -.13 | .18 | -.06 | .48 |
| Relationship status | -.01 | .04 | -.03 | .76 |  | -.02 | .05 | -.04 | .75 |  | -.01 | .05 | -.03 | .78 |
| Teaching licensure | .02 | .11 | .01 | .89 |  | .07 | .11 | .06 | .51 |  | .04 | .10 | .04 | .67 |
| Administrator(s) |  |  |  |  |  | -.01 | .04 | -.03 | .81 |  | -.02 | .03 | -.08 | .49 |
| Teachers at school |  |  |  |  |  | -.12 | .10 | -.18 | .21 |  | -.16 | .09 | -.24 | .08 |
| Teachers in FFA |  |  |  |  |  | .23 | .09 | .36 | .01 |  | .13 | .08 | .21 | .11 |
| Students |  |  |  |  |  |  |  |  |  |  | .09 | .06 | .19 | .11 |
| Parents of students |  |  |  |  |  |  |  |  |  |  | -.07 | .08 | -.12 | .35 |
| Community |  |  |  |  |  |  |  |  |  |  | -.06 | .06 | -.10 | .32 |
| Spouse or partner |  |  |  |  |  |  |  |  |  |  | -.30 | .09 | .43 | .00 |
| Family |  |  |  |  |  |  |  |  |  |  | -.14 | .10 | -.23 | .15 |
| Friends outside work |  |  |  |  |  |  |  |  |  |  | .21 | .09 | .34 | .02 |
| *Adjusted R2* |  | 0.07 | |  |  |  | 0.11 | |  |  |  | 0.25 | |  |
| *F* |  | 2.78 (5,113) | |  |  |  | 2.79 (3,110) | |  |  |  | 3.85 (6,104) | |  |
| Δ*R2* |  | 0.11 | |  |  |  | 0.06 | |  |  |  | 0.17 | |  |
| Δ*F* |  | 2.78 | |  |  |  | 2.61 | |  |  |  | 4.55 | |  |

*Note.* The dependent variable for the models is the mean score of overall teacher self-efficacy. Independent variables for school sources of support included administrator(s), teachers at school, teachers in FFA section or district, students, parents of students, and community. Independent variables for non-school sources of support were spouse or partner, family, and friends outside of work.   
\**p* < .05

To describe the contribution of the *types* of social support (e.g., emotional/appraisal, informational, and instrumental) toward *teacher self-efficacy* in novice agricultural education teachers, the author identified the outcome variable as the *overall mean of teacher self-efficacy* for the regression. The overall model, which included the three social support constructs, was significant, *F* = 4.38(3,110, *p* < .05), explaining 14.7% (*adjusted R2* = .15) of the variance in teacher self-efficacy. However, the three individual social support constructs (e.g., *emotional/appraisal*, *informational*, and *instrumental* support) were not statistically significant (*p* < .05) predictors of novice teacher self-efficacy.

**Conclusions and Discussion**

Novice agricultural education teachers’ perceptions of support from school sources – predominantly *students* and *community* – explained 25.3% of the variance in teacher self-efficacy. Whereas mastery experiences are widely recognized as the primary source of self-efficacy, the results from this study imply the support (i.e., verbal or social persuasion) novice agricultural education teachers perceive from students and community are the most significant predictors of teacher self-efficacy.

Although the psychological construct of support is complex, researchers confirm the characteristics of support are demonstrated within the context of relationships, which contributes to an individual’s physiological, psychological, and emotional well-being. A relationship is “an association between two interacting partners,” wherein trust, loyalty, and mutual commitment are developed over time (Cropanzano & Mitchell, 2005, p. 883). Moreover, quality relationships demonstrate reciprocity, are founded in mutual trust and respect, and are characterized by frequent interactions which result in emotional familiarity and mutually beneficial outcomes (Heaney & Israel, 2008). As novice teachers strive to develop relationships with *students* and *community* who they can rely on to provide social support, the psychological state of trust grows from within the dynamics of a quality relationship. Trust involves (a) the reciprocity to care for and demonstrate consideration of another person; (b) feelings of mutual obligation, honesty, and vulnerability; and (c) an expectation that the emotional investment expressed within the relationship will result in positive intentions or behaviors (Cropanzano & Mitchell, 2005; Dirks & Ferrin, 2002; Evans & Revelle, 2008; Rotter, 1971). *Support* and *trust* are the foundations of a quality relationship; over time, positive day-to-day exchanges with *students* and *community* can deepen the level of trust and support in relationships, lead to interpersonal attachment, and help affirm novice teachers’ beliefs that others support and trust their abilities as a teacher. Novice teachers must perceive support from *students* and *community* to improve the likelihood of teacher retention.

The results of this study affirm the need for the psychological perception of available support, regardless of the specific *type* of support received (Brouwers, Evers, & Tomic, 2001; Cohen, 2004; DeAngelis et al., 2013; Fantilli & McDougall, 2009; Lakey & Cohen, 2000; Nurullah, 2012). In spite of the negative effects of reality shock, culture shock, and isolation, novice teachers must feel valued and supported to reduce attrition (Burke et al., 2015; Hancock & Scherff, 2010). The psychological construct of support will be most effective at increasing teacher self-efficacy and improving career commitment when novice teachers of agriculture develop the awareness to recognize support, the emotional capacity to feel worthy of support, and demonstrate a willingness to seek out and accept support when offered.

**Recommendations**

Conclusions drawn from this research provide opportunities for school administrators, teacher educators, and agricultural education professionals to integrate best practices in mentoring and induction programs. Formalized programs should be provided for novice teachers to help them navigate the responsibilities associated with the beginning years of the profession, offer opportunities for feedback and support, and determine ways to develop specific relationship-building techniques with students and members of the community. Ongoing and varying forms of support are needed from school and non-school sources to help novice agricultural education teachers mitigate the challenges of the profession, feel efficacious in their role as an educator and FFA advisor, and promote sustained performance and longevity as a career educator.

Limited research has been completed in education on ways to access and utilize social support to enhance teacher self-efficacy, whereby potentially reducing attrition. Questions for additional research include exploration of the relationship between perceptions of support and trust from school sources of support (e.g., principal, colleagues, students, parents). The second recommendation is to compare perceptions of social support among five groups of agricultural education teachers: (a) preservice teachers; (b) novice teachers (i.e., teachers with five or fewer years of experience) who are currently teaching; (c) mid-career teachers (i.e., teachers with more than five, but less than ten years of experience); (d) teachers who left the profession of agricultural education with five or fewer years of experience; and (e) veteran teachers (i.e., teachers with more than ten years of experience) who have remained in the profession. The research objectives might explore differences among each group of educators relative to their years of teaching experience and stage of teacher development. Enhanced knowledge of the ways to improve the social support to subsequently enhance teacher self-efficacy may potentially reduce attrition.

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**A Comparison of School Based Agricultural Education Students’ Psychological Needs**

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**Introduction**

School-Based Agricultural Education (SBAE) programs utilize a tripartite model for the purposes of (a) preparing students for entry into agricultural occupations, (b) entrepreneurship and job advancement, and (c) agricultural literacy (Phipps, Osborne, Dyer, & Ball, 2008). Through the program structure and practices utilized within, SBAE programs strive to positively develop their youth participants. Similarly, Positive Youth Development (PYD) programs focus on developing mutually beneficial relationships, that will have effects on the self, family, community, and society (Lerner, Phelps, Forman, & Bowers, 2009). Additionally, PYD programs strive to develop self-identities; initiative; basic emotional, cognitive, and physical skills; competence; social connections; and motivation (Hansen, Larson, & Dworkin, 2003).

Engagement in PYD programs, such as SBAE programs, can positively affect the youth who participate in them in numerous ways, including developing a positive self-identify, decreasing delinquent behavior, and increasing positive relationships (Hansen et al., 2003). Additionally, program evaluations indicate that successful youth development programs develop social, emotional, cognitive, behavioral, and moral skills; support autonomy; are youth-centered; develop interpersonal and social competence; and provide positive adult support (Eccles & Templeton, 2002; Larson & Walker, 2010). Through the inherent structure of and activities within, PYD programs can support youths’ psychological needs of competence, autonomy, and relatedness (Dawes & Larson, 2011; Larson & Rusk, 2010; Larson & Walker, 2010). PYD programs help to support relatedness through positive adult relationships and developed friendships (Csikszentmihalyi & Larson, 1984; Lerner et al., 2009). Competence is supported through the roles youth play within program design and implementation (Eccles & Gootman, 2002). PYD programs can support autonomy through youth engagement in challenging materials, program decision making, and leadership positions (Eccles & Gootman, 2002). As PYD programs meet these needs, they also increase youths’ intrinsic motivation (Deci & Ryan, 2000; Ryan & Deci, 2002). If PYD programs develop intrinsic motivation, youth can experience sustained motivation and sustained engagement in the activity/organization (Larson & Rusk, 2011).

While no SBAE literature empirically measures the psychological needs constructs, the SBAE research which relates is limited in scope. Regarding the need for autonomy, Ball, Bowling, and Bird (2016) found that during Career Development Event (CDE) preparation SBAE teachers would provide choices (autonomy) to students in regard to the content studied and the ways in which it was taught. Additionally, students experience volition when participating in general FFA civic engagement activities (Bird, 2012). However, when participating in service activities such as the National FFA Days of Service, a lack of perceived choice existed (Roberts, Terry, Brown, & Ramsey, 2016). Concerning the need for relatedness, SBAE programs provide students with adult support and the ability to develop friendships and positive peer groups (Witt, Doerfert, Ulmer, Burris, & Lan, 2013). Regarding competence, no existing studies have investigated students’ perceived cognitive competence within or outside of the SBAE classroom. Literature does indicate that through SBAE participation students are able to develop social competence (Phelps, Henry, & Bird, 2012). The existing literature around SBAE students’ psychological needs is severally lacking in breath and depth. Very few studies investigate the three psychological needs separately, and currently no studies exist that look at them as an entire paradigm.

**Theoretical Framework**

Self-Determination Theory (SDT; Ryan & Deci, 2002) served as the theoretical framework for this study. SDT asserts the psychological needs of competence, relatedness, and autonomy are universal, innate needs all humans strive to fulfill (Deci & Ryan, 2000; Ryan & Deci, 2002). Within SDT, competence is defined as the felt sense of confidence and efficacy in action, not focusing on attained skill or capability (Deci & Ryan, 2000; Ryan & Deci, 2002). Relatedness is having a sense of belonging or feeling connected to others (Deci & Ryan, 2000; Ryan & Deci, 2002). Autonomy is defined as the perception that one is the origin or source of one’s own behavior (Deci & Ryan, 2000; Ryan & Deci, 2002). Through the fulfillment of the psychological needs, well-being and life satisfaction are sustained (Leversen, Danielsen, Birkeland, & Samdal, 2012; Tian, Chen, & Huebner, 2014). Additionally, supporting the psychological needs of autonomy, relatedness, and competence helps to develop and sustain intrinsic motivation (Deci & Ryan, 2000; Ryan & Deci, 2002).

**Purpose and Objectives**

The purpose of this study was to investigate SBAE students’ psychological need support. The study was driven by the following objectives:

1. Describe students’ psychological need support within and outside SBAE programs.
2. Compare students’ psychological need support within SBAE programs to needs support experienced within the students’ time outside of the program.

**Methods**

This study employed a quantitative explanatory design which aimed to describe and compare student autonomy, relatedness, and competence within and outside of SBAE programs. Due to this study being part of a larger mixed methods study and the limited research related to psychological need support within SBAE programs purposive sampling was utilized to identify SBAE programs which upheld all components of the three circle model. Five SBAE programs within Missouri were selected which utilized of a variety of curricular resources within a variety of classroom and laboratory settings, earned the Top 10% FFA chapter award, had multiple state qualifying CDE teams, and met the recommended Supervised Agricultural Experience project visits. Within the five participating schools, all FFA members (*n* = 368) were recruited to participate and through the completion of consent and assent forms students self-selected into the study. Following the collection of parent consent and student assent forms, the resulting consenting sample was *n* = 245 with a response rate of 67%. The consenting sample who provided a completed quantitative questionnaire resulted in the final usable data sample of *n* = 222 with a response rate of 60%. The average student participant was female (*n* = 120; 54.05%), a freshman (*n* = 106; 47.75%), had not attended any FFA conventions (*n* = 109; 49.10%), had not held an FFA office (*n* = 178; 80.18%), had not competed in CDEs (*n* = 126; 56.76%), and identified agriculture as the future career area they wish to seek (*n* = 62; 27.93%).

For the purposes of this study, the Basic Psychological Needs Scale (BPNS; Deci, & Ryan, 2006) was utilized to capture the desired data sought and was delivered online in the students’ SBAE classes. The BPNS measures the degree to which students’ psychological needs are satisfied and consisted of the constructs: relatedness, competence, and autonomy. The BPNS instrument included a seven-point Likert scale with the following anchors: 1: not at all true, 4: somewhat true, and 7: very true. The BPNS instrument also included headings which instructed students to reflect on their experiences within their SBAE classes and FFA chapter, and life away from the SBAE program.

To address validity of the instrument, we consulted a panel of experts (*n* = 4). The members of the panel held expertise in the areas of SBAE, formal education, PYD programs, motivation, statistics, and quantitative methodology. A pilot study was conducted with a representative sample of SBAE students (*n* = 26) not included in the data collection. The Cronbach’s alpha for the autonomy construct was found to be 0.79, the relatedness construct was 0.71, and the competence construct was 0.79. Reliability estimates were calculated for the current studies sample. The BPNS instrument (*n* = 222) had a Cronbach’s alpha of 0.76 for the autonomy construct, 0.77 for the relatedness construct, and 0.74 for the the competence construct.

Mean and standard deviation were used to describe the student needs support within and outside the SBAE programs. To describe the student need support we set the following real limits (Fife-Schaw, 2006): a score of 1.00 to 1.50 was considered highly thwarted, 1.51 to 2.50 was considered thwarted, 2.51 to 3.50 was considered slightly thwarted, 3.51 to 4.50 was considered neutral, 4.51 to 5.50 slightly supported, 5.51 to 6.50 supported, and 6.51 to 7.00 highly supported. Paired samples *t*-test were calculated to compare student need support within and outside the SBAE programs. The data met all assumptions needed for conducting t-tests, other than the need for a random sample (Field, 2013).

**Results**

Objective one soughtto describe students’ psychological need support within and outside SBAE programs (see Table 1). The need of competence within and outside the SBAE program was slightly supported (SBAE *M* = 4.52, *SD* = 0.96; Outside *M* = 4.71. *SD* = 0.90). The need of relatedness within and outside the SBAE program was slightly supported (SBAE *M* = 4.87, *SD* = 0.86; Outside *M* = 5.04, *SD* = 0.87). The need of autonomy within and outside the SBAE program was slightly supported (SBAE *M* = 4.70, *SD* = 1.00; Outside *M* = 4.97, *SD* = 0.85).

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| --- | --- | --- | --- |
| Table 1 | | | |
| *Description of Psychological Need Support Within and Outside SBAE Program (n = 222)* | | | |
| Psychological Need | Context | *M* | *SD* |
| Competence | SBAE Program | 4.52 | 0.96 |
| Outside SBAE Program | 4.71 | 0.90 |
| Relatedness | SBAE Program | 4.87 | 0.86 |
| Outside SBAE Program | 5.04 | 0.87 |
| Autonomy | SBAE Program | 4.70 | 1.00 |
| Outside SBAE Program | 4.97 | 0.85 |
| *Note*. Seven-point Likert scale anchors: 1: not at all true, 4: somewhat true, and 7: very true. | | | |

Objective two sought to compare students’ psychological need support within SBAE programs to needs support experienced within the students’ time outside of the program. The results indicated there was a difference (*t*221 = -3.83, *p* < 0.01) between student competence experienced within SBAE programs (*M* = 4.52, *SD* = 0.96) and competence experienced outside of the SBAE program (*M* = 4.71, *SD* = 0.90). The difference represented a small effect size (*d* = 0.20). A difference was found (*t*221 = -3.50, *p* < 0.01) between student relatedness experienced within SBAE programs (*M* = 4.87, *SD* = 0.86) and relatedness experienced outside of the SBAE program (*M* = 5.04, *SD* = 0.87). The difference represented a small effect size (*d* = 0.19). The results also indicated there was a difference (*t*221 = -4.74, *p* < 0.01) between student autonomy experienced within SBAE programs (*M* = 4.70, *SD* = 1.00) and autonomy experienced outside if the SBAE program (*M* = 4.97, *SD* = 0.85). The difference represented a small effect size (*d* = 0.29).

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| Table 2 | | | | | | | |
| *Comparison of Psychological Needs Support Within and Outside SBAE Programs* | | | | | | | |
|  | SBAE Program (*n* = 222) | | Outside SBAE Program (*n* = 222) | |  |  |  |
| Need | *M* | *SD* | *M* | *SD* | *t* | *p* | *d* |
| Competence | 4.52 | 0.96 | 4.71 | 0.90 | -3.83 | 0.00\* | 0.20 |
| Relatedness | 4.87 | 0.86 | 5.04 | 0.87 | -3.50 | 0.00\* | 0.19 |
| Autonomy | 4.70 | 1.00 | 4.97 | 0.85 | -4.74 | 0.00\* | 0.29 |

**Conclusions, Implications, and Recommendations**

Due to the sampling techniques utilized, this study is limited to the participants and should be interpreted with caution. From the results of objective one, it was concluded that the needs of competence, relatedness, and autonomy were all slightly supported within the SBAE programs which aligns with both previous SBAE literature (Ball et al., 2016; Bird, 2012; Witt et al., 2013) and PYD literature (Dawes & Larson, 2011; Larson & Rusk, 2010; Larson & Walker, 2010). It was also concluded that all needs were slightly supported outside of the SBAE programs. The needs for competence and autonomy both displayed larger standard deviations demonstrating a larger variance in levels of support within the SBAE program. For objective two, it was concluded that a negative difference existed between needs support within and outside of the SBAE programs, however a small effect size did exist. Thus, it was concluded that support for autonomy, competence, and relatedness was slightly higher outside of the SBAE program.

The findings implied that while slight need support was seen within SBAE programs, students were experiencing more needs support outside of the program. Thus, students are experiencing more competence, relatedness, and autonomy through some facet outside of the SBAE program potentially within other classes, after school programs, athletics, family activities, or other leisure time activities. Further, within the participating SBAE programs much room for improvement exists to better support the psychological needs of students to potentially increase well-being and life satisfaction.

While the results of the study came from a limited sample in a single state, some recommendations can be made that readers can assess for application to their own situation. It is recommended that SBAE teachers strive to support student psychological needs within all facets of the SBAE program. To do this professional development should be implemented to help introduce SBAE teachers to the psychological needs of competence, relatedness, and autonomy, their potential benefits, and ways to support the needs within SBAE programs. Teachers can support psychological needs through encouraging strong relationships, encouraging student participation in program design and implementation, and having students participate in challenging materials, program decision making, and leadership positions (Csikszentmihalyi & Larson, 1984; Eccles & Gootman, 2002; Lerner et al., 2009). Further research is recommended to better examine psychological need support within SBAE programs. To begin, this study should be replicated with a larger, multi-state random sample. It is also important to note, that a majority of participants were freshman and at the time of the study would only have engaged with the high school SBAE program for 6 to 8 months. Thus, future studies should incorporate students within all grade levels and compare psychological need support based on years engaged in a SBAE program. Additional quantitative studies should also compare the psychological needs of SBAE students to that of their non-SBAE peers. Qualitative studies should be conducted to identify ways in which psychological needs are supported and thwarted within SBAE programs. Additional quantitative studies should investigate any predictors and/or relationships which exist within SBAE programs which influence psychological needs support.

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# Research Session II

## 10:30am to 12:00 noon

**Hansen Agriculture Student Learning Center**

**Concurrent Session D**

**Room: Iowa Beef Industry Classroom**

**Session Theme: Extension Education and Communication**

**Discussant: Misty Lambert, Iowa State University**

**Facilitator: Guang Han, Iowa State University**

**Is Today's Social Technology Impacting Written Communications? A Single Case Examination of an Introduction to Agricultural Education Writing Assignment**

Ashley Daggs, Jon Ulmer, Erica Irlbeck, David Doerfert

**The Influence of Community Engagement and Youth Leadership Life Skills Development on Texas 4-H Members Sense of Community**

Emily Perdue, James Lindner, Gary Briers, Harry Boone, Kirk Edney

**Pennsylvania Agricultural Producers’ Observations of Changing Environmental Conditions: Implications for Research and Extension**

Kaila Thorn, Rama Radhakrishna, Daniel Tobin

**Is Today's Social Technology Impacting Written Communications? A Single Case Examination of an Introduction to Agricultural Education Writing Assignment**

Ashley Daggs, Sullivan, Higdon & Sink  
Jonathan D Ulmer, Kansas State University  
Erica Irlbeck, Texas Tech University  
David Doerfert, Texas Tech University

# Introduction

With increased focus on newly introduced social technologies, it becomes critical for educators to understand the impact social technology may have on the quality of written communication skills. According to researchers that studied the relationship between social technology use and the quality of written communication skills, language continues to deteriorate due to the increased use of electronic communication platforms (Leu, 2000; Mohd, Mohd, & Saifuddin, 2009). Approximately 68% of Advanced Placement teachers reported social technologies allow students “to take shortcuts and not put effort into their writing” (Purcell, Buchanan, & Friedrich, 2013, p. 3). However, 78% find that social technologies “encourage student creativity and personal expression” (Purcell et al., 2013, p. 2).

The changes in the quality of written communications skills has been studied on several occasions with agricultural communications students (Irlbeck & Akers, 2009; Morgan, 2010; Morgan, 2012; Sprecker & Rudd, 1997; and Terry, et al., 1994); however, written skills of agricultural education students has not been researched in depth. As technologies connected to literacy continue to advance, there is increasing concern in regard to how electronic communication platforms may affect writing. With nearly 90% of American college students accessing Facebook (a leading social networking site), 75% participating in daily text-messaging, and 92% e-mailing daily e-mail, it can be assumed that written communication skills may deteriorate over time (Duchene, 2007; Lenhart et al., 2008; Lenhart, 2012; Purcell & Rainie, 2014). Therefore, it is extremely important to identify both the negative and positive effects that frequently used social technologies may have on the demonstration of written communication skills among today's college students.

There is little doubt that social technology use affects written communication skills in a variety of ways, but how social technologies affect writing is still in question. Social media and smart phones provide a broad audience for written material, (Purcell et al., 2013); however, "younger generations have forgotten how to spell and write complete sentences due to the increased use of text messaging on mobile phones" (Deleo, 2008, p. 2). Technology could have a positive impact on written communications, with students being more thoughtful and attentive of the message they share (Jayakumar, 2013). Buding and Heaps (2013) agreed that shifts in writing styles may be positive, but the quality of written communications must always be carefully considered.

The purpose of this study was to understand the impact of increased technology use, specifically text messaging and other computer mediated communications, on the written communication skills of students in an introductory agricultural education course. The following research questions guided the study:

1. What is the level of social technology use (text messaging, e-mail, & social media) of students enrolled in an introductory agricultural education course?
2. What is the quality of written communication skills of these students?
3. Is there a correlation between social technologies (text messaging, e-mail, & social media) on the written communications skills of the students?

Participants in this study were selected from students enrolled in an introductory agricultural education course, and selection was limited to those willing to participate.

## Conceptual Framework

Reinking, McKenna, Labbo, and Kieffer (1998) defined transformative literacy as "a phenomenon leading to a change in literacy as a result of human interaction with newly developed technologies" (p. x). Transformative literacy addresses the overall focus of changing written communication skills as caused by technology use, and is linked to determinism, which is "the idea that every event is necessitated by antecedent events and conditions together with the laws of nature" (para. 1). Expanding upon this idea, technological determinism is described as "an approach that identifies technology, or technological advances, as the central causal element in processes of social change" (Croteau & Hoynes, 2003, p. 299). Technological determinism states that as technologies become more stable, user behavior will begin to be dictated by technological design aspects (Croteau & Hoynes, 2003). Considering that there are evident changes occurring in regard to the social and educational practices of students as a result of increased technological use, it is imperative to understand the transformations we see in terms of written communications of today's students.

## Methodology

The study utilized a descriptive correlational case study design. Ary, Jacobs, and Sorenson (2010) described case studies as “an examination of a single individual, group, or institution” (p. 637). Case studies are an appropriate methodology to consider when a researcher aims to understand characteristics of phenomena, individuals, or institutions (Berg, 2009). Correlational research is described as “research that attempts to determine the extent and the direction of the relationship between two or more variables” (Ary et al., 2010, p. 639); it involves various forms of research instruments: questionnaires, interviews, or content analysis to gather the data needed.

This study examined a group of students in an introductory agricultural education course. Students enrolled in the course, taught by instructors that agreed to participate in the study, served as the unit of analysis. Students who did not return an IRB-approved consent form were omitted from the study, resulting in 38 participating students. Once returned, the co-investigator sent a student participation e-mail asking each student to (1) complete a technology use survey and (2) submit a computer-generated, pre-determined class writing assignment. Student completion of these tasks determined the final set of data points for the study (*n* = 18).

For the purpose of this study, a researcher-created instrument was used. This instrument was developed based upon a annual Pew Research Center Internet and Technology Survey (Pew Research Center, 2017a; 2017b) in an attempt to address all areas of current communication technology use by today’s college students. The instrument was divided into two sections and comprised of 25 questions. The researcher also used a writing sample analysis tool based on 10 departures from edited standard written English (Walvoord & Anderson,1998). These departures included sentence fragment, run-on sentence or comma splice, misused semicolon, error in verb form or tense, error in subject/verb agreement, error in pronoun agreement or form, spelling mistakes, capitalization mistakes, homophone mistakes, and sentences lacking sentence sense. The researcher did not alter the original analysis tool.

In order to ensure the validity of the survey instrument a panel of experts in agricultural education and agricultural communications reviewed the instrument for both face and content validity. Input from these individuals reinforced the selection of the items for the survey. Pilot tests are typically conducted to ensure reliability in regard to the measurement of mental attributes, attributes that typically lead to higher levels of measurement imprecision than physical attributes (Willmott & Nuttall, 1975). Considering that the survey instrument used in this study was geared towards physical attribute measurement, a pilot study was not required to measure reliability.

Participants provided an e-mail address received a link to the questionnaire administered via Qualtrics. Following the completion of questionnaires, students e-mailed a computer-generated, pre-determined class writing assignment. The selected writing assignment was approximately two pages and addressed the criteria previously set forth by the course instructor for a speaker reflection writing assignment. The assignments were submitted to the instructor prior to data collection and a numerical grade was assigned.

Writing samples were analyzed with the writing analysis tool (Walvoord & Anderson, 1998). An initial score of 100 points was possible for the writing sample; the researcher subtracted one point from the initial score for each departure. All data were analyzed using SPSS version 20.0. Descriptive statistics were reported for measures of central tendency. In order to interpret the data associated with Research Question Three the researcher utilized point-biserial, Spearman-rank order, and Pearson product moment correlations to determine the impact of technologies (text messaging, e-mail, & social media) on the written communications skills of students. The magnitude of correlations was determined by Davis’ (1971) descriptors.

Demographics of the participants was as follows: 15 (83.3%) female and three (16.7%) male; ages ranged from 19-24 with 19 being the mode age; freshmen accounted for 50% (*n* = 9) of respondents, with 16.7% (*n* = 3) sophomore and 33.3% (*n* = 6) junior; 16 (88.9%) identified their hometown as a rural community.

## Findings

All students reported they owned a desktop and/or laptop and owned a smartphone. All had daily Internet access, sent and/or received email, and utilized Facebook. Some used Twitter (15, 83.3%) and Instagram (17, 94.4%). The majority of students indicated a frequency of multiple times per hour for four items: smartphones for texting, apps, social media, and internet. Students indicated that on a daily basis they were involved in an average of 0 to 10 email conversations (1.06) (*SD* = 0.24) and exchanged 0 to 5 emails per conversation (1.00) (*SD* = 0.00). Students also reported an average of 0 to 10 daily text message conversations (1.00) (*SD* = 0.00). The mean category for number of text messages exchanged per conversation was between 21 and 40 text messages (M = 2.94, *SD* = 9.00). The majority of students (10, 55.5%) scored between 90 and 100 points on their writing sample, followed by seven students (38.9%) scoring between 80 and 89, and one student (5.6%) who scored between 60 and 69. The mean score for quality of written communications skills of students was relatively high at 89.22 (*SD* = 6.85).

A Spearman rank-order correlation (*r*s) was used to describe the influence of technology use on the written communication skills of students (see Table 1). A moderate, negative correlation was observed between the quality of written communication skills and the following five items: Twitter profile ownership (-.40), social media use to post messages to a friend’s wall (-.30), social media use to send bulletin and/or group messages (-.31), social media use to comment on a picture and/or a status (-.42), and tablet use for text based activities (-.44). One substantial negative correlation was noted between social media use to comment on a blog post and written communication skills (-.50). Correlations could not be calculated between all written communications skills and the variables, because all students answered identically.

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| Table 1 *Influence of Technology Use on the Written Communication Skills of Students (n = 18)* | |
| Variable | Writing Sample Score (rs) |
| Computer Used | -.08 |
| Smartphone Used for Text-Based Activities | -.21 |
| Tablet Used for Text-Based Activities | -.44 |
| Cell Phone Used-Phone Calls | .17 |
| Cell Phone Used-Applications | .16 |
| Cell Phone Used-Internet | .03 |
| Cell Phone Used-Social Media Activities | -.16 |
| Cell Phone Used-Texting | -.22 |
| Social Media-Instagram Accessed | -.12 |
| Social Media-Twitter Accessed | -.21 |
| Social Media-Send Instant Message or Text Message | -.24 |
| Social Media-Facebook Accessed | -.27 |
| Social Media-Send Private Messages | -.29 |
| Social Media-LinkedIn Accessed | -.29 |
| Social Media-Post Messages to a Friend’s Wall | -.30 |
| Social Media-Send Bulletin or Group Message | -.31 |
| Social Media-Comment on a Picture or Status | -.42 |
| Social Media-Comment on a Blog Post | -.50 |
|  |  |

## 

## Conclusions and Implications and Recommendations

Responses indicated that current technology presence is geared toward computers and smartphones as well as applications such as email, Facebook, Twitter, and Instagram – findings that are consistent with previous research (Duggan, 2013; Duggan et. al, 2015; Pew Research Center, 2017a; 2017b; Purcell & Raunie, 2014; Smith & Caruso, 2010). Tablet ownership and LinkedIn profile ownership were indicated as less popular, findings that are again consistent with previous research (Pew Research Center, 2017a). These findings allowed the researcher to conclude that students prefer computers or small hand-held devices and show increasing presence in regard to social applications.

Students demonstrated elevated frequency use patterns of about once per day or more frequently in situations related to computer use, as well as smartphone use for texting, apps, calls, social media, internet, Facebook, and Instagram. These conclusions support previous research (Duggan, 2013; Duggan et. al, 2015; Pew Research Center, 2017a; 2017b; Purcell & Rainie, 2014; Smith & Caruso, 2010). Students prefer texting over email as a means of written communication, data consistent with Lenhart’s (2012) findings that 75% of teens take part in text message conversations daily.

It is evident that Facebook, Instagram, and Twitter play a large role in students’ technology repertoire and could be utilized in classrooms as outlets to increase the quality of students’ written communications. With texting growing as the preferred means of written communication among students, it may be beneficial to emphasize the use of formal email communication in educational settings to maintain professional written communication skills.

Students demonstrated high levels of quality in their written communication, with approximately 94% of students scoring above 80 points. These findings are consistent with Conroy (2010) but refute the claims made by Purcell et al. (2013). When exploring the relationships between technology and the quality of written communication skills, it can be concluded that technology presence and the frequency of technology use may have an impact on the quality of students’ written communication skills. It can also be concluded that increasing participation in the aforementioned activities could lead to students being less concerned of the rules of formal written communications, and in turn, could allow for emergence of less formal written communications, data consistent with assertions made by Purcell et al. (2013).

When considering the relationships between technologies (text messaging, e-mail, & social media) and written communication skill sets, it is imperative to understand the role social media activities could play in the emergence of informal written communications. It may be advantageous to utilize these social media activities in educational and/or professional settings to stress the importance of formal written communications.

Throughout this study, it was expected that the quality of written communication skills would decrease significantly as the use of social technologies increased, similar to results achieved in previous research studies (Deleo, 2008; Jayakumar, 2013; Lenhart et al., 2008; Leu, 2000; Mohd, 2009; Purcell at al., 2013; State Examination Commission, 2006). However, the findings indicated that the participating students demonstrated a higher quality of formal written communication skills, despite their increased use of social technologies, and may be adequately prepared for workplace settings. These findings are inconsistent with researchers like Irlbeck and Akers (2009) but consistent with multiple other researchers (Chang & Chen, 2009; Liang & Tsai, 2010; Lu & Bol, 2007; Van Gennip, Segers, & Tillema, 2010). The research indicated that devices such as tablets and social media sites such as Instagram and LinkedIn have a positive relationship with quality of written communication

Determining the relationship between technology use and the changing written communication skills of students will prove vital to detection of students who may be inadequately prepared for the workplace. Identification of ill-prepared students will allow educators and industry leaders the opportunity to create curricula and/or specialized training programs specifically focused on the development of formal written communication skills.

It is recommended that this study be replicated with a larger population to account for the limited generalizability resulting from a case study. Alternative methods of collecting the pre-determined class writing assignment concurrently with the computer-generated technology use survey should be explored. The use of a more inclusive writing sample analysis tool should be explored as the tool used was limited to 10 departures from edited standard written English and allowed several written communication errors to go unaccounted for. This tool should include a more in-depth analysis of grammar and punctuation and account for the conciseness of writing samples analyzed.

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**The Influence of Community Engagement and Youth Leadership Life Skills Development on Texas 4-H Members’ Sense of Community**

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**Introduction**

A study by Tuft’s University and the Institute for Applied Research in Youth Development (Lerner, Lerner, & Colleagues, 2013) found that 4-Hers are four times more likely to actively contribute to their community, two times more likely to be civically active, and five times more likely than their peers to graduate from college. Brennan, Barnett, & Baugh presented the need for program developers to better understand the role of youth in community development (2007). Extension programming like 4-H “plays a vital role in engaging youth through interactions with the local community” (Brennan, Barnett, & Baugh, 2007, p.1).

The purpose of this study was to examine the influence of community engagement and youth leadership life skills development on Texas 4-H members’ sense of community which fits within research priority six; vibrant, resilient communities of the American Association of Agricultural Education National Research Agenda (Roberts, Harder, & Brashears, 2016). The findings presented in this abstract are part of a larger study.

The main objectives of the study were to: 1) describe participant’s sense of community, 2) examine the relationship between personal characteristics, leadership life skills, and sense of community, and 3) determine the influence of community engagement, leadership life skills, and personal characteristics of sense of community.

**Theoretical Framework**

The theoretical framework for this study is based upon McMillan Chavis’ theory of sense of community. Sense of community is defined as the feeling community “members have of belonging, a feeling that members matter to one another and to the group, and a shared faith that members’ needs will be met through their commitment to be together (McMillan & Chavis, 1986, p.9). Community can refer to either a territorial or physical community such as a neighborhood or a relational community such as a professional organization or church (McMillan & Chavis, 1986).

Social scientists in the field of psychology study sense of community in terms of the communication between members of a neighborhood and how the feelings members experience help them form attachments to their community. The theory of sense of community includes four essential components: membership, influence, integration and fulfillment of needs, and shared emotional connection (McMillan & Chavis, 1986).

Membership is the sense of belonging one feels toward their community (McMillan & Chavis, 1986). Influence refers to the ability to impact the decisions of a community. Integration and fulfillment of needs refers to the “degree that communities successfully facilitate person-environment fit (meeting of needs) among members” leading them to develop a sense of community (McMillan & Chavis, 1986, p. 15). A shared emotional connection is the ability to identify with or be a part of a shared history of the community. This includes the quality of interactions between people and how often they interact with each other.

**Methodology**

Survey research methodology was used to conduct this study. The target population for this study included members of the Texas 4-H & Youth Development Program who were enrolled for the 2015-2016 year. Cochran’s (1977) formula for continuous data was used to calculate sample size. Stratified random sampling was used to select equal numbers of participants per strata (in this case grade level). This sampling technique is used when researchers want to look at differences among strata (Ary, Jacobs, & Sorenson, 2010).

According to the Texas 4-H enrollment system, 18,462 members were enrolled in grades seven through twelve (T. Lepley, personal communication, November 2015). The required sample size for a population of 18,462 is 119. This sample size does not exceed 5% of the population, therefore, Cochran’s (1977) correction formula was not used to calculate the final sample size. In total, 793 4-Hers were asked to participate in this study, eight opted out of taking the survey, one hundred seventy eight responses were received and 15 responses were deleted due to incomplete data resulting in a 22.45% return rate and a final sample of (*N* = 163). This study is limited to current 4-H members in the state of Texas and results may not be generalized to other states or similar youth development programs.   
  
 The Tailored Design Method for developing and distributing an electronic survey was employed for this study (Dillman, Smyth, & Christian, 2014). The questionnaire was administered using Qualtrics. The research instruments in this study were previously developed. The survey had three sections: sense of community, career and educational aspirations, and leadership life skills.

Sense of Community

This portion of the survey measured participants’ sense of community. The Interpersonal Community Engagement Scale was developed by Corrigan (2004). The scale measured participants’ “level of communication and involvement to better gauge the connection one feels to his or her neighborhood, and to empirically measure if strong community relationships have an effect on a youth’s behaviors and educational attitudes” (Corrigan, 2004, p. 36-37). This section of the instrument consists of twelve statements based on a seven-point Likert scale, 1 = *strongly disagree*, 2 = *moderately disagree*, 3 = *disagree*, 4 = *neither agree nor disagree*, 5 = *agree*, 6 = *moderately agree*, and 7 *= strongly agree*. The scale was interpreted as follows: s*trongly disagree* = 1.00 – 1.49, *moderately disagree* = 1.50 – 2.49, *disagree* = 2.50 – 3.49, *neither agree nor disagree* = 3.50 – 4.49, *agree* = 4.50 – 5.49, *moderately agree* = 5.50 – 6.49, and *strongly agree* = 6.50 – 7.00.

**Career and Educational Aspirations**

This section of the survey measured participants’ career and educational aspirations and was developed by Adedokun & Balschweid (2008) and consisted of thirteen closed-ended questions about choosing what kind of job and how far a participant plans to go in school (two year degree, four year degree, or graduate degree). This section also included eight statements based on a seven-point likert scale where 1 = *strongly disagree*, 2 = *moderately disagree*, 3 = *disagree*, 4 = *neither agree nor disagree*, 5 = *agree*, 6 = *moderately agree*, and 7 *= strongly agree*. The scale was interpreted as follows: s*trongly disagree* = 1.00 – 1.49, *moderately disagree* = 1.50 – 2.49, *disagree* = 2.50 – 3.49, *neither agree nor disagree* = 3.50 – 4.49, *agree* = 4.50 – 5.49, *moderately agree* = 5.50 – 6.49, and *strongly agree* = 6.50 – 7.00.

Four statements measured parental involvement in a participant’s educational and career aspiration decisions. The last four statements of this section measured what level of agreement or disagreement the participants feel they can achieve their educational or career goals in their current community.

**Leadership Life Skills**

This section of the survey measures a youths’ perceived life skills gained from participation in Texas 4-H within five subscales. This portion of the survey was developed by Stafford (2001) and consisted of 33 statements based on a seven-point Likert scale where 1 = *strongly disagree*, 2 = *moderately disagree*, 3 = *disagree*, 4 = *neither agree nor disagree*, 5 = *agree*, 6 = *moderately agree*, and 7 *= strongly agree*. Stafford developed the questions using the Leadership Skills Inventory developed by Townsend and Carter (1983) and Dorman (1997). The subscales for Stafford’s study were adapted from the Stratford Public Schools exit outcomes to measure leadership life skills (Locke, 2004; Stafford J. , 2001). The five subscales specifically measured creative problem solver, personal leadership development, being a self-directed learner, contributor to community, and effective team skills.

The subscales, followed by the number of questions include Creative Problem Solver (5), Personal Leadership Development (6), Being A Self-Directed Learner (5), Contributor to Community (8), and Effective Teams Skills (9). Demographics questions were developed based on the literature (Knowles, Holton, & Swanson, 1998; Treffinger, 1995).

Each question was based on a six point Likert-type scale, A = Strongly Agree, B = Disagree, C = Slightly Disagree, D = Slightly Agree, E = Agree, F = Strongly Agree. For the purpose of this study, the researcher modifed Locke’s (2004) instrument and removed questions pertaining to Being A Self-Directed Learner and Creative Problem Solver. The scale was converted to seven points and the letters were converted to numbers. The overall reliability for Stafford’s (2001) instrument which Locke (2004) reported was based on a Cronbach’s alpa (α = .90). The reliability for each subscale was also calculated and was reported as: Effective Team Skills (α = .70), Self-Directed Learner (α = .72), Contributor to Community (α = .85), Creative Problem Solver (α = .76), and Personal Leadership Development (α = .71). The scale was interpreted as follows: s*trongly disagree* = 1.00 – 1.49, *moderately disagree* = 1.50 – 2.49, *disagree* = 2.50 – 3.49, *neither agree nor disagree* = 3.50 – 4.49, *agree* = 4.50 – 5.49, *moderately agree* = 5.50 – 6.49, and *strongly agree* = 6.50 – 7.00.

A pilot test was conducted to test for reliability and validity with members of the Texas A&M University Collegiate 4-H Club. Thirty members of the collegiate 4-H club responded to the survey and six responses were removed due to missing data. Cronbach’s alpha coefficient was calculated for each internal scale (Cronbach, 1951). A reliability of .80 is generally acknowledged as an acceptable rate of internal reliability (Bryman, 2012). Table 1 displays the reliability levels of the internal scales.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Table 1 *Reliabilty Levels of Internal Scales* | |  |  | |
|  | |  | α Levels | |
| Internal Scale | | Number of Items | Pilot Study | Formal Study |
| Interpersonal Community Engagement | | 12 | .801 | .800 |
| Personal Leadership Development | | 6 | .820 | .911 |
| Effective Team Skills | | 9 | .861 | .905 |
| Contributor to Community | | 8 | .900 | .940 |
| Parental Influence | | 4 | .618 | .862 |
| Achieve Dream Job/Career in my Community | | 4 | -.574 | .033 |
|  | *Note*. Reliability levels ≥ .80 were considered acceptable. | | | |

**Results and Findings**

Table 2 describes participants’ overall sense of community and attachment. The scale was interpreted as follows: s*trongly disagree* = 1.00 – 1.49, *moderately disagree* = 1.50 – 2.49, *disagree* = 2.50 – 3.49, *neither agree nor disagree* = 3.50 – 4.49, *agree* = 4.50 – 5.49, *moderately agree* = 5.50 – 6.49, and *strongly agree* = 6.50 – 7.00.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Table 2 *Descriptive Statistics for Interpersonal Community Engagement* | | | | |
| Items | *N* | *M* |  | *SD* |
| I feel a strong connection to the community where I live. | 163 | 5.17 |  | 1.56 |
| I feel my relationships with my neighbors are very valuable. | 163 | 4.90 |  | 1.48 |
| I have many places and friends to go to for help in my neighborhood. | 163 | 4.87 |  | 1.56 |
| I have many friendships with adults in my neighborhood. | 163 | 4.78 |  | 1.60 |
| The adults in my neighborhood serve as role models. | 162 | 4.75 |  | 1.52 |
| My relationships with my neighbors have helped me to be a better person. | 163 | 4.63 |  | 1.48 |
| I know my neighbors very well on a personal basis. | 162 | 4.57 |  | 1.81 |
| Considering the residents in my community, I personally know most of them. | 163 | 4.47 |  | 1.67 |
| I communicate with my neighbors at least once a week. | 162 | 4.30 |  | 1.69 |
| I do not know many neighbors well. | 162 | 3.65 |  | 1.74 |
| I spend quality time with my neighbors at least once a week. | 163 | 3.64 |  | 1.61 |
| I do not feel a strong sense of connection to the community where I live. | 163 | 2.98 |  | 1.70 |
| *Note*. Overall M = 4.39, *SD* = .90. *Scale*: 1 = *Strongly Disagree*, 2 = *Moderately Disagree*, 3 = *Disagree*, 4 = *Neither Agree nor Disagree*, 5 = *Agree*, 6 = *Moderately Agree*, 7 = *Strongly Agree*. | | | | |

Participants neither agreed nor disagreed that they had a strong sense of community attachment (*M* = 4.39, *SD* = 0.90). Participants agreed that they feel a strong connection to the community where they live (*M* = 5.17, *SD* = 1.56), feel their relationships with their neighbors are valuable (*M* = 4.90, *SD* = 1.48), have many places and friends to go for help (*M* = 4.87, *SD* = 1.56), have many friendships with adults in their neighborhood (*M* = 4.78, *SD* = 1.60), think adults in their community serve as role models (*M* = 4.75, *SD* = 1.52), relationships with their neighbors helped them become a better person (*M* = 4.63, *SD* = 1.48), and know their neighbors on a personal basis (*M* = 4.57, *SD* = 1.81).

Participants neither agreed nor disagreed that they personally know most of the residents in their community (*M* = 4.47, *SD* = 1.67), communicate with their neighbors at least once a week (*M* = 4.30, *SD* = 1.69), do not know their neighbors well (*M* = 3.65, *SD* = 1.74), and spend quality time with their neighbors at least once a week (*M* = 3.64, *SD* = 1.61), Participants disagreed that they do not feel a strong connection to their community where they live (*M* = 2.98, *SD* = 1.70).

The Pearson’s product-moment correlations between each variable can be found in Table 3. The magnitude of each relationship was determined by Davis (1971). The noted magnitudes of the relationship between variables are: .01 ≥ *r* ≥ .09 = Negligible, .10 ≥ *r* ≥ .29 = Low, .30 ≥ *r* ≥ .49 = Moderate, .50 ≥ *r* ≥ .69 = Substantial, *r* ≥ .70 = Very Strong (Davis, 1971).

Table 3  
*Pearson Correlation Coefficients*

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | Contributor to Community | Effective Team Skills | Personal Leadership Development | Grade Level | Gender | Educational Aspirations | Dream Job or Career |
| Interpersonal Community Engagement | .30\*\* | .29\*\* | .26\*\* | -.10 | -.01 | .10 | -.07 |
| *Note.* \* Correlation is significant at the .05 level (2-tailed)  \*\* Correlation is significant at the .01 level (2-tailed). | | | | | | | |

Stepwise linear regression was used to determine the influence of personal characteristics, leadership life skills, and community engagement on sense of community. The dependent variable was interpersonal community engagement and independent variables included contributor to the community, personal leadership development, educational aspirations, dream job, gender, and GPA. The leadership life skills construct of contributor to community and grade level were found to be significant predictors of sense of community. Table 4 displays the regression model.

Table 4  
*Regression Model*

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | *R* | *R2* | *B* | *Beta* | *t-value* | *p* |
| Model 1 | .300a | .090 | .427 | .300 | 3.949 | .001 |
| Model 2 | .369b | .136 | -6.308 | -.216 | -2.907 | .004 |
| *Note*. a. Predictors: (Constant), Contributor to Community  b. Predictors: (Constant), Contributor to Community, Grade Level  c. Dependent Variable: Interpersonal Community Engagement | | | | | | |

**Conclusions, Implications, and Recommendations**

Participants agreed that they feel a strong connection to the community where they live (*M* = 5.17, *SD* = 1.56) and disagree (*M* = 2.98, *SD* = 1.70) that they *do not* feel a strong sense of connection to their community. Overall, however, they neither agreed nor disagreed they have strong relationships with neighbors and adults in their physical neighborhood. Future research should study which aspects of life in a community (e.g., participation in youth group, 4-H, sports, clubs, student council, etc.) make youth feel connected.

The relationship between personal characteristics, leadership life skills, and sense of community were examined using Pearson’s product-moment correlation which measures both the direction and magnitude of the relationship between two variables (Ary, Jacobs, & Sorenson, 2010). Statistically significant, but low relationships were found between gender and contributor to community (*r* = .18), effective team skills (*r* = .22), and personal leadership development (*r* = .20). A significant and low negative correlation was also found between dream job or career and contributor to the community (*r* = - .17). Causation cannot be implied; however, a significant correlation was found between contributor to the community and dream job or career. Research has shown that community engagement and place of residence influences educational and career aspirations (Adedokun & Balschweid, 2008; Haller & Virkler, 1993; Ferry, 2006; Williams, Thompson, Taylor, & Sanders, 2010). The researcher recommends exploring interpersonal community engagement within relational communities that possibly influence educational and career aspirations.

The stepwise method was used to determine which independent variables influenced sense of community. The regression model found the leadership life skills construct of contributor to the community and grade level were significant predictors of sense of community. At the time of this study, no research had examined the relationship between youth leadership life skills and sense of community (Hastings, Barrett, Barbuto, Jr., & Bell, 2011). However, research has shown that older adolescents have a significantly lower sense of community. This could be due to the developmental stage and age of the participant (Pretty, Conroy, Dugay, Fowler, & Williams, 1996). Future studies should more thoroughly examine the territorial and relational communities of youth and how these communities influence leadership life skills or vice versa.

Based on the results of this study recommendations for practice and future research include:

* Examine what aspects of relational communities influence adolescents’ sense of community through both quantitative and qualitative research methods.
* Future studies should be expanded to compare 4-H members and non-4-H members sense of community to see what, if any, differences exist.
* Future studies should also explore the differences between rural and urban youth who participate in the program.
* The study should be replicated in other states in 4-H and other youth development programs such as Big Brothers-Big Sisters or Key Club.

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**Pennsylvania Agricultural Producers’ Observations of Changing Environmental Conditions: Implications for Research and Extension**

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**Introduction and Need**

In the Northeastern region of the United States, agriculture is being impacted by climate change as seen through increases in; unpredictability in storms, variability in precipitation, and fluctuations in temperatures (Romero-Lankao & Smith, 2014). Climate change adaptations and mitigation strategies for agriculture exist and are effective, however farmers are reluctant to adopt this new technology (Arbuckle, et al., 2014). Understanding how Northeastern farmers have observed the environmental conditions they experience daily can inform climate change programming to this target audience.

An extensive literature review, which examined over 70 articles from across the country, examined farmer perceptions of climate change and indicated only four empirical studies conducted in the Northeast (Chatrchyan, et al., 2017). Examples of research include a Maine study examining producers’ perceptions and adaptations to variable weather (Jemison Jr., Hall, Welcomer, & Haskel, 2014) and a study specific to Vermont maple producers (Kuehn, Chase, Sharkey, & Powers, 2016). However, as climate change impacts occur globally but are felt and interpreted locally, there is a need to better understand Pennsylvania farmers’ observations of environmental conditions, and ways in which researchers and Extension professionals can work with producers to manage impacts experienced from changing environmental conditions.

These impacts are not new and ways to manage them are still manifesting themselves in recently created local and national agendas. Within the American Association for Agricultural Education seven priorities exist for the 2016-2020 National Research Agenda (Roberts, Harder, & Brashears, 2016). Of those seven priorities, four are reflected in this study focusing on the communication of complex issues. Research priority one, looks at the *public and policy makers’ understanding of agriculture and natural resources*. Research priority two, examines *new technologies, practices and products and the decisions that are adopted* because of them, while research priority five deals with *efficient and effective agricultural education programs*. The final research priority of *addressing complex problems* focuses on how to best communicate this complex issue of climate change, with farmers. While all four of these priorities are challenging, communicating the complex problem of climate change with all key stakeholders, in an efficient and effective manner, is essential in managing the changes that are to come with the global phenomenon.

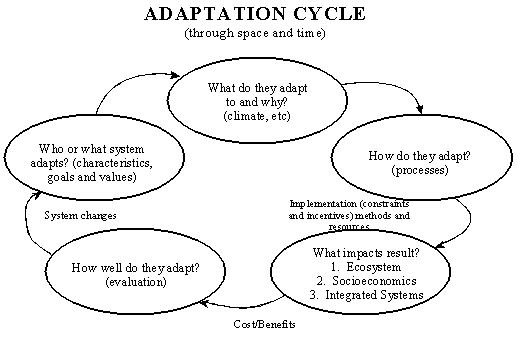
**Purpose and Objectives**

This study stems from a larger study that examined a more comprehensive examination of Pennsylvania agricultural producers’ perspectives, barriers, and communication channels as they relate to climate change. The purpose of this study, is to specifically examine the environmental conditions producers perceive. Two objectives guided this study (1) determine what Pennsylvania agricultural producers’ perceptions of environmental conditions in the past ten years and their concerns about the same in environmental conditions for the next 10 years, and (2) determine if Pennsylvania agricultural producers’ perceptions of environmental conditions corresponds with their demographic data.

**Theoretical/Conceptual Framework**

The conceptual framework used in this study stemmed from Park et al. (2012) Adaptation Action Cycle’s framework, which consists of two interchangeable cycles (1) transformational adaptation and (2) incremental adaptation, with four stages: (a) problem structuring, (b) developing agenda, vision, and pathway, (c) implementing actions, and (d) evaluating, monitoring, and learning. Park et al. utilizes the Adaptation Action Cycle framework as a way to guide the understanding of adaptations in the context of climate change. The researchers then incorporated Wheaton and MacIver’s (1999) Adaptation Cycle to better understand the specifics of adaptation. The Adaptation Cycle (Wheaton and MacIver, 1999) consists of five key questions (See Figure 1). The initial starting point of this study stems from incremental adaptation, specifically the stage of *problem structuring and establishing the incremental adaptation arena*. This stage of p*roblem structuring* is further broken down into the question of *who or what system adapts* from the Adaptation Cycle. Using this question to guide discussion around changing environmental conditions, can assist in determining what environmental conditions a producer is most likely to adapt to.

**Figure 1: Adaptation Cycle Proposed by Wheaton and MacIver (1999)**



**Methodology**

The target population for this study consisted of Pennsylvania agricultural producers (N=59,309). Through working with a major agricultural journal, the final sampling frame for the study consisted of 3,860 producers. Using Krejcie and Morgan (1970) sampling procedures, the sample size was determined to be 357 producers for a 95% confidence interval and a 5% margin of error. However researchers oversampled to 500 in order to compensate for limitations in the sampling frame.

A survey instrument developed by researchers, was reviewed by a panel of experts, as well as field and pilot tested to ensure validity and reliability respectively. The survey contained six sections gathering data on a variety of climate change adaptation information, farming practices, barriers, influential groups that impact adaptations, delivery methods, and demographic information. The questions on the survey were measured using nominal, ordinal and ratio scales.

Following Dillman’s five-point, tailored design method (Dillman, Smyth, & Christian, 2014), five mailings occurred over an eight-week period. In total, 260 surveys (52.1%) were returned with 252 (50.5%) surveys usable for analysis. Non-respondents were contacted through phone calls. Early, late and non-respondents were compared on key questions on the survey and no significant differences were found between the groups and thus the results are generalizable to the sample population (Miller & Smith, 1983; Radhakrishna & Doemekpor, 2008).

As indicated earlier, this abstract is part of a larger study, two questions from the larger study were asked regarding producers’ observations and concerns regarding environmental conditions. These questions were *how you observed the following changing conditions on your farm in the past 10 years when compared to 20 years ago* (question 8 on the survey), and *when thinking about the next 10 years, please share with us if you are concerned about the following conditions on your farming* (question 9 on the survey)*.* Both questions consisted of 14 items of the same known environmental conditions for the area, allowing producers to indicate “yes,” “no,” or “unsure,” for each condition. In addition, eight of the 17 demographic characteristics of agricultural producers and their farms were also used. Descriptive and non-parametric statistical analyses were conducted to summarize the data.

**Results**

*Demographic Profile:* Producers’ average age was 59 years old, with the youngest being 22 years and the oldest being 90 years. When categorized, the majority of the producers (77.2%) were in the age range of 51-90 years. The overwhelming majority of respondents (95%) were male. In total, 67.5% of respondents indicating that they owned and rented portions of their land and were the primary operators. Often associated with farming culture is a sense of tradition, with multiple generations choosing to farm. The majority of respondents (51.6%) were fourth-generation farmers. Less than 10% indicated they were a first-generation farmer (6.3%). In regards to political affiliation, the majority of respondents identified with the Republican Party (67.8%), while 18.4% affiliated with the Democratic Party and 10% indicated no political affiliation.

Regarding retirement plans, 53.0% indicated they were not planning on retiring in the next 5 years, 37% indicated “maybe” and “yes” they had plans to retire in the next5 years. Over one-half of the respondents (54.4%) had a high school level education, while another 40.8% had education through undergraduate or professional degrees. As for income level, over half of respondents (58.6%) had an annual net income of $0.00-$74.999, while the remaining 41.4% of respondents had an annual net income of $75,000-$200,000+.

*Objective One:* Determine what Pennsylvania agricultural producers’ perceptions of environmental conditions in the past ten years and their concerns about the same in environmental conditions for the next 10 years

As shown in Table 1, respondents showed marked separation in their responses to the observed environmental conditions and future concerns for the same environmental conditions. For environmental conditions observed in the past ten years, respondents indicated “warmer winter temperatures,” “abnormal precipitation events,” and “late frosts” as the top ranked observed conditions, based on respondent percentages. However, when looking to the future as to what conditions respondents were most concerned about, their responses did not reflect the same environmental conditions. The top three future conditions were “drought,” “abnormal precipitation events,” and “increased pests” (Table 1). While “abnormal precipitation events” did carry over, the other two top future conditions had previously been ranked as 7th and 8th of observed over the past ten years. This indicates a separation between what producers had observed and what concerns they have in the future.

Spearmen rank order correlation (Mendenhall & Ramey, 1973) was calculated to determine the agreement between past and future observations of environmental conditions. Although separation in rankings exists, there was no significant disagreement between the two rankings. The obtained value of rs=0.452 was similar to the critical value of rs=0.457 at the 0.05 level.

Table 1

*Rank Order of Observed Past and Future Concerns of Environmental Conditions*

|  |  |  |
| --- | --- | --- |
|  | **Past ten years**  **observations** | **Future ten years**  **concerns** |
| **List of environmental conditions** | **Ranked** | **Ranked** |
| Warmer winter temperatures | 1 | 6 |
| Abnormal precipitation events | 2 | **2** |
| Late frosts | 3 | 11 |
| Warmer summer temperatures | 4 | 7 |
| Excessive winds | 5 | **5** |
| Longer growing season | 6 | 14 |
| Drought | 7 | **1** |
| Increased pests | 8 | **3** |
| Increased diseases | 9 | **4** |
| Increased parasites | 10 | 8 |
| Increased flooding | 11 | 9 |
| Colder summer temperatures | 12 | 12 |
| Colder winter temperatures | 13 | 13 |
| Early frosts | 14 | 9 |

*Objective two*: Determine if Pennsylvania agricultural producers’ perception of environmental conditions corresponds with producer’s select farm and demographic characteristics that included; land ownership, generation of farming, planned retirement, planned successor, education level, annual net income, off-farm income, and political affiliation.

The analysis of research objective two was completed using chi-square, as both environmental condition questions and all demographic questions were measured on a nominal scale. For environmental conditions that were observed in the past ten years, only two of the eight demographic characteristics showed significant relationships; “generation of farming” and “political affiliation.” See Table 2. In particular, “generation of farming” consistently held the highest percentage of responses for *4th generation or higher* and regarding “political affiliation” the highest percentage of responses were consistently reported for *Republican Party*. This significant relationship indicates there is an association between “generation of farming,” and “political affiliation,” and environmental conditions, specifically concerning *4th generation or higher* and the *Republican Party*. Additionally, as shown in Table 2, “generation of farming” was related to six of the 14 past environmental conditions, while seven conditions were related to the “political affiliation” variable.

Table 2

*Chi Square Significance for Past and Future Observed Environmental Conditions*

|  |  |  |  |
| --- | --- | --- | --- |
| **Past** | |  | **Future** |
| **Generation of Farmer** A | **Political Affiliation** B | **Environmental Conditions** | **Political Affiliation** A |
| **Chi Value** | **Chi Value** |  | **Chi Value** |
| 9.62\* | 5.67 | Abnormal Precipitation Events | 7.17\* |
| 1.94 | 0.04 | Colder Summer Temp | 2.26 |
| 2.64 | 3.44 | Colder Winter Temp | 1.56 |
| 12.34\* | 7.21\* | Warmer Summer Temp | 9.27\* |
| 14.04\* | 8.26\* | Warmer Winter Temp | 12.53\* |
| 5.03 | 2.10 | Drought | 3.07 |
| 2.14 | 6.44\* | Excessive Winds | 3.01 |
| 4.81 | 12.12\* | Increased Diseases | 7.03\* |
| 3.01 | 8.81\* | Increased Flooding | 6.97\* |
| 9.89\* | 9.88\* | Increased Parasites | 12.26\* |
| 5.91 | 9.86\* | Increased Pests | 4.87 |
| 4.40 | 0.27 | Early Frosts | 1.46 |
| 9.10\* | 2.34 | Late Frosts | 7.27\* |
| 12.03\* | 1.15 | Longer Growing Season | 2.43 |

\*P< .05

A Respondents selected from “first generation,” “second generation,” “third generation,” or “fourth or higher.”

B Respondents selected from “republican,” “democrat,” “other,” or “not applicable.”

For environmental conditions that were concerns for the future ten years, only one of the eight variables that is, “political affiliation” was related to seven future environmental conditions, see Table 2. For all seven of these environmental conditions, the “political affiliation” response of *Republican Party* consistently held a higher percentage of responses. This indicates that when thinking of future concerns, the only demographic characteristic related to future concerns of environmental conditions was that of “political affiliation,” specifically that of the *Republican Party*.

**Conclusions**

The results of this study indicate that there are similarities between the environmental conditions that producers have observed in the past and what their future concerns are, as seen with “abnormal precipitation” events being a top ranked past observation as well as a top ranked future concern. However, there is discrepancy with the remainder of the top five past and future environmental conditions. While producers indicated observing “warmer winter temperatures” and “late frosts,” there did not seem to be a high concern for the upcoming ten years, with conditions ranked 6th and 11th respectively for future concerns. Interestingly the top future concerns for the upcoming ten years were “drought” and an “increase in pests.” While they are environmental conditions, previous literature suggests that these conditions are products of a warmer winter through decreases in snowpack and late frosts which allows for pest to linger longer than if they were deterred from an earlier frost date (Horton et al., 2014). These results indicate a potential disconnect between a felt environmental condition and the cause of those conditions.

Relating back to the theoretical framework, there were two questions being presented. First from Park et al., use of the incremental adaptation cycle the stage of *problem structuring* was used to understand what environmental problems producers are experiencing. The first research objective tackles this question through determining what environmental conditions producers have observed in the past and their future concerns. The results of this objective indicate specific conditions that need to be addressed when Extension educators and researchers are structuring what concerns producers have. Future environmental conditions such as “drought” and “increased pests” will need to be addressed when determining what problems producers need assistance in managing. Both objectives address the second question stemming from Wheaton et al.’s *what do they adapt to and why*? This question is answered first by identifying the specific environmental conditions that producers have observed and are concerned about in the future. The second part of the question is answered through the relationships found with the roles of the “generation” and the “political affiliation” of a producer and how those related to the past and future environmental conditions.

Specific to the second objective, it is interesting to note that the “generation of farmer” played a significant role in determining the past observed conditions. The survey question specifically asked respondents to reflect on the past ten years, in comparison to the past 20 years, as the national average age range of farmers is 55-64 years (USDA 2012 Census Highlights, 2012) [and the average age of this study’s respondents was 59 years](https://www.agcensus.usda.gov/Publications/2012/Online_Resources/Highlights/Farm_Demographics/#average_age) and the average age of this study's respndents was 59 years, ), a comparison of the past 20 years was appropriate. Therefore all respondents who completed the generation question had been farming long enough in their family to reflect on those specific years. As for “political affiliation,” the majority of respondents (67.8%) to the survey as a whole indicated their political affiliation was for the Republican Party. This is not surprising as previous studies have indicated a polarization between belief in climate change and political affiliation (McCright & Dunlap, 2011). Political affiliation, might have more to do with individual environmental conditions indicated in both past observations and future concerns, in ways that these respondents view the impacts of the condition and how they relate to their farm in particular. For example, perhaps Republican respondents viewed these conditions as more of a future concern due to the role that government regulation or business plays in the ways in which to manage impacts from these conditions.

**Implications/Recommendations/Impact on Profession**

This study provides insight into what Pennsylvania agricultural producers have observed and what their anticipated environmental conditions will be in the future. This finding can assist researchers, Extension professionals, and other climate change outreach organizations in determining the best ways to work with agricultural producers when conversing about environmental conditions and ways to adapt to impacts felt from these conditions.

Findings from this study are valuable in establishing producers’ perceptions of environmental conditions in Pennsylvania. This understanding has the potential to impact future discourse between producers and outreach organizations in determining the best ways to address future climate change programming efforts. Additionally, this study informs Extension and other outreach organizations as to the generational role of producers as well as the role that political affiliation can have on their perception of environmental conditions. Taking proactive steps will go a long way to address the impact of observed changes to environmental conditions.

Future recommendations include:

1. Working with local producers to understand how they interpreted the environmental conditions around them, and what their future concerns are in regards to environmental conditions. Such understanding will be of immense value to research and Extension faculty and educators to develop climate adaptation programs that addresses critical needs of agricultural producers in Pennsylvania. Extension faculty and educators have the opportunity to incorporate climate change adaptation strategies that address environmental conditions that producers are concerned about. In doing so, climate change adaptation strategies have the potential of being more accepted by an audience who may be reluctant to the controversial global phenomenon.
2. Conduct needs assessment to carry out educational programming to increase producers’ understanding of the advantages and disadvantages of focusing on adapting to only one environmental condition. Developing and delivering programs for specific environmental conditions will enhance the effectiveness of programming and its resulting impact on climate adaptations.
3. Research faculty and Extension program staff involved in climate change efforts should understand the role that previous generations of producers and political affiliation play in their target audiences being receptive to climate change programs. This will aid in helping researchers and educators to develop programs and decision support tools that have a greater chance of being incorporated by producers. For example, as the number of farms is decreasing and the reluctance of younger generation of farmers to continue the family tradition of farming, examining the role of family tradition of farming is critical to understand why the younger generation is reluctant to continue in farming sector.
4. Given the future concern for farms in Pennsylvania, research faculty and Extension program staff should use the findings from this study to better understand the best adaptation methods for different producers in relation to top future environmental conditions. Such understanding will serve as a spring board for future research and Extension programming efforts and assist outreach efforts in being proactive when managing a complex problem such as climate change.

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**Concurrent Session E**

**Room: Iowa Dairy Farmers’ Classroom**

**Session Theme: Pre Service**

**Discussant: Thomas Paulson, Morningside College**

**Facilitator: Deborah Boone, West Virginia University**

**The Science Teaching Efficacy of Preservice Agricultural Teachers**

Nathan Conner, Amanda Woodward, Jamie Loizzo, Christopher Stripling

**The Role of Collaboration throughout the Agricultural Education Student Teaching Experience**

Jay Solomonson, Scott Smalley

**An Examination of the Questioning Habits of Pre-Service Teachers when Planning for Student Learning**

Callie Moles, Jessica Blythe

**The Science Teaching Efficacy of Preservice Agricultural Teachers**

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**Introduction**

According to the National Research Council (NRC) (2009), students today have the opportunity to address some of the most urgent and complex problems facing society. The NRC (2007) suggested that future generations of students will continue to make meaningful contributions to society and will help position the United States to be a world leader in the pursuit of science, technology, and innovation through research that is supported by the government and other research institutions. A booming world population and growing global economy have given developing countries an opportunity to compete on the same playing field, due to decreased labor costs and lower costs of operation (NRC, 2007). In order for the U.S. to remain a world leader, it must optimize resources to excel within the sciences (NRC, 2007). The U. S. must develop “a highly skilled workforce with a range of mid-level trade, technical, and professional skills as well as high-level skills, usually associated with a university education” (Stone, 2017, p. 156). The NRC (2007) explained the needs and demands of the American workforce have been shifting for decades, creating the need for an extensive reform of K-12 STEM (science, technology, engineering, mathematics) education. The Business-Higher Education Forum (BHEF) (2013) agreed with the NRC findings, that the U.S. must restructure education to foster the development of engineers, technicians, scientists, and STEM educators. BHEF (2014) stated, “with more than 8.6 million STEM-related jobs anticipated by the year 2018, preparing and encouraging our students to pursue STEM majors and careers becomes even more important. Unfortunately, students on average are struggling to succeed in STEM-related subjects” (p. 2).

The field of Career and Technical Education (CTE) is a potential route for addressing the need to train the next generation of STEM workers. Stone (2017) stated that CTE programs connect core academic courses like math, science, English, and social studies, to real world applications which in turn, emphasize and support concepts students learn in core classes. Agricultural education has proven to be a valid context for science education (Brister & Swortzel, 2009). Stubbs and Myers (2016) found that the integration of STEM into agricultural courses, compliments the content being taught in other courses and aids in the learning process. However, McKim and Velez (2016) described that integrating science content into agricultural courses can be challenging for some teachers. The researchers found that many school based agricultural education teachers have low self-efficacy, a lack of confidence, when it comes to teaching science concepts and skills. McKim and Velez recommended that agricultural teachers observe other agricultural teachers who effectively teach science through the context of agriculture.

**Purpose**

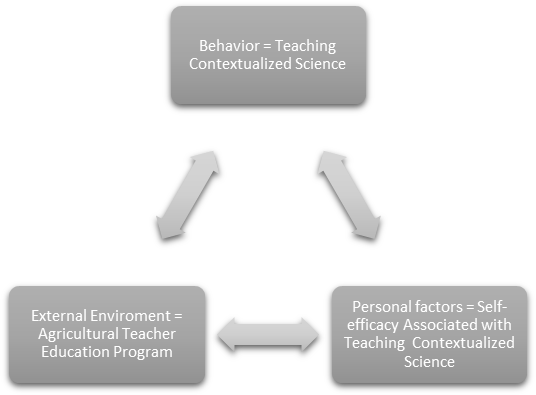
The purpose of this study was to describe science teaching efficacy and science teaching outcome expectancy of preservice agricultural education teachers enrolled in an agricultural teaching methods course integrated with science concepts, science principles, and inquiry-based learning through demonstrations, microteachings, and case studies. More specifically, the objectives of this study were to:

1. Describe the perceived science teaching efficacy of preservice agricultural education teachers.
2. Describe the perceived science teaching outcome expectancy of preservice agricultural education teachers.

**Theoretical framework**

This study was guided by Bandura’s (1986) social learning theory and the concept of self-efficacy. Bandura’s (1977) social learning theory posits that human behavior and ideas are shaped by a variety internal and external forces. Bandura (1977) rejected prior learning theorists’ claims that learning could be categorized only as a change in behavior due to the exclusion of social interactions. Social learning theory is illustrated by the triadic reciprocity model, where behavior, personal factors, and the external environment are interconnected. Bandura (1997) stated, “Social cognitive theory encompasses a large set of factors that operate as regulators and motivators of established cognitive, social, and behavioral skills” (p. 35).

In the context of this research, behavior is operationalized as the act of teaching contextualized science, personal factors are self-efficacy associated with teaching contextualized science, and the external environment is the teacher education program.



*Figure1.* Triadic reciprocity model. Adapted from Bandura (1986) and Stripling and Roberts (2013).

Bandura (1994) defined self-efficacy as people’s beliefs about their ability to succeed in specific situations or to accomplish a task. The way a person views their abilities plays a major role in how they approach challenging situations, how they feel, and how they think. Self-efficacy may determine an individual’s behavior and level of motivation, and shapes “peoples’ judgments of their capabilities to organize and execute courses of action required to attain designated types of performances” (Bandura, 1986, p. 391). According to Bandura (1994,1997), there are four factors which influence an individual’s self-efficacy: (1) past experiences (2) vicarious experiences (3) social persuasion, and (4) emotional state. Although there are a variety of factors which influence self-efficacy, each one does not have an equal influence, past experiences/mastery experiences are vastly more significant than the other factors (Bandura, 1997).

**Methods**

A science teaching efficacy belief instrument (STEBI) was modified from Enoch and Riggs (1990) and was used as a pre and post instrument. Ten preservice agricultural teachers took the instrument prior to and upon completion of an agricultural teaching methods course. Our instrument used STEBI items specifically centered around science teaching efficacy and the “Science Teaching Outcome Expectancy Scale” (Enoch & Riggs, 1990, p. 8). Enoch and Riggs reported that the reliability had an alpha of 0.92 for the Personal Science Teaching Efficacy Belief items and an alpha of 0.74 for the Science Teaching Outcome Expectancy items. Originally, Enoch and Riggs created the instrument for elementary school teachers. We modified the instrument to make it more appropriate for high school teachers. Example questions used to measure personal science teaching efficacy include the following: a) I will continually find better ways to teach science, and b) Even if I try very hard, I will not teach science as well as I will most subjects (Enoch & Riggs, 1990). Example questions used to measure science teaching outcome expectancy include the following: a) When the science grades of students improve, it is often due to their teacher having found a more effective teaching approach, and b) If students are underachieving in science, it is most likely due to ineffective science teaching (Enoch & Riggs, 1990).

All 10 students enrolled in the agricultural teaching methods course agreed to participate, making this a census of preservice agriculture teachers enrolled in the agricultural teaching methods course during the spring of 2016 at the University of Nebraska. Since this was a census, the results are not generalizable. The participants were all working toward a teaching certificate in Nebraska and were preparing to student teach the following year. Participants consisted of nine females and one male. The Institutional Review Board approved this study before data collection began. Participants were sent an email informing them of the study and were asked to consider participating. One week later, all of the potential participants signed consent forms and took the science teaching efficacy instrument. The instrument was initially administered at the beginning of the semester and once again at the end of the semester. The instrument was administered by a research who was not the instructor for the agricultural teaching methods course. The pen and paper instrument was administered during class time in a face-to-face setting, and took approximately 15 minutes to complete.

The data were analyzed using IBM SPSS version 20 and frequencies and percentages were used to describe the level of agreement or disagreement for each of the 23 items. The instrument used a Likert type scale that included the following options: strongly agree, agree, uncertain, disagree, and strongly disagree.

The agricultural teaching methods course is an undergraduate three-hour course designed for preserve agriculture teachers to gain knowledge and skills that will assist them to teach secondary agricultural courses. The course focused on the following teaching approaches: a) inquiry based learning, b) lecture, c) questioning, c) demonstration, d) discussion, e) cooperative learning, and f) individual application. Each participant had the opportunity to use each of the teaching approaches in a microteaching setting that took place during class time. A total of seven micro teachings were completed by each participant and each one of the microteachings focused on integrating science within the animal and food systems, and natural resources context. The microteachings allowed the student to teach short lessons in front of nine classmates, lasting 5-20 minutes in length. Participants were asked to use the Nebraska agriculture standards and Nebraska science standards to identify the science concepts and skills that would be taught in their microteachings. Additionally, science concepts and skills were used by the instructor of the course to provide a context for learning how to facilitate learning through different teaching approaches.

**Results**

The results of the STEBI are listed in Table 1. The results of the personal science teaching efficacy belief scale indicate the preservice agriculture teachers are moderately efficacious in their perceived ability to teach science. Upon completion of a science enhanced agricultural teaching methods course, the participants increased their perceived personal science teaching efficacy. Similarly, the results of the science teaching outcome expectancy scale indicate that the participants hold moderate beliefs toward science teaching outcome expectancy, but it appears the course did not have much influence.

Table 1

Science Teaching Efficacy Scores

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Personal Science Teaching Efficacy Belief Scale | | | Science Teaching Outcome Expectancy Scale | |
|  | μ | σ | μ | σ |
| Pretest | 3.81 | .32 | 3.62 | .33 |
| Posttest | 4.06 | .51 | 3.70 | .38 |

*Note. Coding* Scales: (1 = *strongly disagree* to 5 = *strongly agree*)

**Conclusions and Recommendations**

The purpose of this study was to describe science teaching efficacy and science teaching outcome expectancy of preservice agricultural education teachers enrolled in an agricultural teaching methods course integrated with science concepts, science principles, and inquiry-based learning. Initially the participants were moderately efficacious (μ=3.81), which differed from McKim and Velez (2016) assertion that high school agriculture teachers have low science teaching self-efficacy. However, this could be due to the difference in the participants. McKim and Velez used in-service agricultural teachers, whereas we used preservice agricultural teachers. The preservice teachers had more recently or were currently enrolled in science courses as part of their undergraduate degree program, which may have attributed to the participants feeling moderately efficacious in their science teaching ability. According to Bandura (1997) past experiences may influence self-efficacy. In this case, prior course work may have attributed to the science teaching efficacy score that was obtained. However, participation in the science enhanced agricultural teaching methods course seemed to increase the participants’ science teaching efficacy. In addition to in class learning activities, participants were required to observe in-service agriculture teachers purposefully integrating science. The combination of in class and out of class learning activities seemed to attribute to the increase in science teaching efficacy and provided what Bandura described as mastery and vicarious experiences. Furthermore, allowing the participants to observe effective teachers aligns with McKim and Velez’s recommendation. Focusing on self-efficacy is critical because high self-efficacy may lead toward a desired behavior (Bandura, 1994), which would be secondary agricultural teachers that continually integrate science into their classroom, thus producing students that are prepared to enter science majors and science related careers (BHEF, 2014).

The science teaching outcome expectancy scores did not increase much after participation in the science enhanced agricultural teaching methods course. This may be attributed to the focus of the constructs questions. The questions focused on the expected on student learning outcomes which is more abstract and more challenging to predict. According to Bandura (1986), self-efficacy may determine an individual’s behavior. Therefore, we recommend that agricultural teacher preparation programs examine their current course work to identify courses in which science concepts, science principles, and inquiry based learning can be integrated. Field experiences in both the high school agriculture and science classroom should be designed to allow the preservice teacher to learn from experienced professionals. Future research should be conducted to identify the most effective teaching practices when infusing the agricultural teacher preparation program with science.

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**The Role of Collaboration throughout the Agricultural Education**

**Student Teaching Experience**

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**Introduction**

Several educational reforms have called for an emphasis on increased collaboration between teachers (Louis, Marks, & Kruse, 1996). In addition, current research has focused on collaboration in professional development. Positive outcomes have been reported for teachers who collaborate, including a higher self-efficacy (Shachar & Shmuelevitz, 1997) and levels of trust (Tschannen-Moran, 2001). Sparks and Hirsh (1997) indicate it is time to move from a dominant training-focused professional development to a method that supports learner-centered views of teaching. “Teacher collaboration is a tool, which can work in helping others work toward a common goal” (Dooner, Mandzuk, & Clifton, 2008, p. 2).

Hargreaves (2001) indicates that collaboration assists teachers in developing during their career. This collaboration helps teachers to develop their collegiality and motives them to return each year (Boone & Boone, 2007). Morse (2000) suggested in order to have educational reform, collaboration is imperative. “Educators will recognize they are not alone in searching for new modes of human exchange. The fact is, this quest for a new way of human exchange is endemic in the social order… Rejecting collaboration is not an option” (Morse, 2000, p. xi).

Working with peers during student teaching helps students to build understanding, and apply the fundamentals in their educational program (Roth and Tobin, 2001). Knowles and Sudzina (1992) even suggest student teachers be placed together in the same school and classrooms.

Some problems associated with the practicum may be alleviated by placing small clusters

or cohorts of preservice teachers together in schools and classrooms. In the contexts envisaged, the direct purpose is to encourage mutual support, collaborative and cooperative preparation, teaching, evaluation, and generally attempting to dispel the notion that teaching is performed in isolation and behind closed doors (p. 19).

The structure and complexity of agricultural education programs present students with a variety of responsibilities and challenges. Cochran-Smith (1991) stated, “the only way for beginners to learn to be both educators and activists is to struggle over time in the company of experienced teachers who are themselves committed to collaboration and reform in their own classrooms” (p. 307). Encouraging collaboration of preservice teachers early and often allows for meaningful learning to emerge and the development for those who actively engage.

**Theoretical Framework**

Vygotsky’s Sociocultural Theory (1962) was utilized to aid in the understanding of pre-service teachers’ experiences related to collaboration during their teacher preparation program. Vygotsky (1962) postulates that higher cognitive functioning originates within a social context and individuals learn best through the interactions they have with their teachers, peers, and other knowledgeable individuals. A key component of Vygotsky’s theory is the construct of the zone of proximal development. The zone of proximal development (ZPD) is described as the area between where an individual can learn independently, without guidance, and knowledge not yet known to them (Vygotsky, 1978). It can be implied this is where true collaboration takes place and learning will occur. Schunk (2012) advocates peer collaboration as an important application of Vygotsky’s theory suggesting “when peers work on tasks cooperatively, the shared social interactions can serve an instructional function” (p. 246).

**Purpose & Objectives**

The need for this study is accentuated in the American Association for Agricultural Education (AAAE) National Research Agenda, and addresses Research Priority 5 as, “Efficient and Effective Agricultural Education Programs” (Roberts, Harder, & Brashears, 2016). Specifically, this study focuses on the research question “how can agricultural leadership, education, and communication practitioners (teachers, extension agents, etc.) collaborate to deliver educational programs effectively?” (Thoron, Myers, & Barrick, 2016, p. 43).

The purpose of this qualitative study is to investigate the collaborative efforts conducted between students teachers hosted in school-based agricultural education programs. Specific objectives include:

1. Describe positive and negative aspects of the student teaching experience.

2. Identify and describe the types of collaboration which take place during the student teaching experience.

3. Identify potential ways for a teacher education program to further enhance collaboration amongst their student teachers.

**Methodology**

A realism epistemological perspective and a basic qualitative approach were utilized to guide this study. Realism states the individuals create meaning from lived experiences (Maxwell, 2012). Merriam and Tisdell (2016) indicate that a basic qualitative study is appropriate when researchers are interested in determining how people interpret and construct meaning within their lived experiences. Since the purpose of this research was to investigate how pre-service teachers describe the collaborative efforts they encountered during their student teaching experience, a qualitative methodology, utilizing the realism epistemological perspective and basic interpretive research approach, were considered appropriate to conduct this study.

Participants were purposively selected based upon their recent completion of their student teaching experience. At the conclusion of the spring 2017 academic semester, sixteen preservice educators (3 males, 13 females) within the same teaching cohort at Iowa State University were asked to respond to a series of open-ended prompts related to collaboration and our specific research objectives. All responses and field notes were analyzed using an open-coding technique. Researchers coded individually, then met together to confirm their results. These were then used to identify significant statements and create themes based upon their responses.

In qualitative studies, reliability and validity are established through the credibility, transferability, dependability, and confirmability attained through their methods (Lincoln and Guba, 1985). Credibility can be related to the level of confidence in the researcher and through triangulation efforts. Both researchers have extensive experience in agricultural education totaling in excess of twenty years of experience. Additionally, analyst triangulation was utilized to ensure findings were comprehensive and robust. To ascertain transferability, research participants were purposively selected for the study based on their recent student teaching experience. To help achieve a high level of dependability, procedures and benchmarks were kept in place and followed. These included using peer-reviewed, credible resources; transcribing data word-for-word; and checking for the accuracy of the transcripts. Confirmability was established by trying to bracket the biases of the researchers. Bracketing is a method used in qualitative research that requires the investigator(s) to put aside their beliefs about the research topic (Creswell, 2013). Furthermore, permission to conduct the study was granted through the Institutional Review Board at Iowa State University.

**Findings**

Student teachers identified a positive component of student teaching was “building relationships with students and teachers”. One student teacher described, “The best part of my experience was being able to connect with students. Building a relationship with each student was very special. I would say overall becoming a role model was also the best part”. A secondary theme which emerged focused on “application of previous instruction”. One student said, “This experience really helped apply all the things I have learned about over the past 4 years and made it all come together for me”. Another student stated, “The best part of my experience was taking over all of the classes and putting everything I had learned in my experience into practice”.

A negative aspect of student teaching experience was “student motivation and discipline”. One student indicated, “trying to motivate students as the student teacher was tough at times”. A secondary theme emerged, which was “transition from student to teacher”. A student teacher indicated, “coming up with curriculum from scratch was difficult and is something I struggled with”. Another indicated, “I struggled with piecing things together in a way that makes the most sense”.

Students participating in this study had an in depth understanding of collaboration. Student characterized it as “working together for a common goal”. Collaborative efforts identified included working with the cooperating teacher, their student teaching cohort, and other high school agriculture teachers. Other avenues for collaboration selected included Communities of Practice (COP), special education teachers, counselors, and other CTE teachers at their placement site. One student indicated, “I worked mainly with my cooperating teacher, but it is important to work with other teachers who have new ideas of teaching or dealing with a particular student”.

Regarding ways collaboration could be enhanced with student teachers, a theme emerged as “additional formal contacts”. Participants believed one way to enhance collaboration was by “using Skype meetings between the student teachers and allowing them to talk to each other and ask questions to enhance collaboration”. It was suggested for this to be done early in the experience to assist in lesson planning and developing a sense of community within the profession.

**Conclusions, Implications, & Recommendations**

There are a variety of positive and negative aspects of the student teaching experience. Interestingly, results indicate working with students as a common positive and negative feature of their experience. While they enjoyed building relationships with students, they also struggled with discipline and motivating the same population. Additionally, they told us it was nice to have the opportunity to actually apply the knowledge they have been accumulating the past four years in a real-world experience. This is something which is consistent with the literature (Roth and Tobin, 2001). However, they also conveyed they felt unprepared for certain aspects of the experience and were lacking proficiency in several key areas, including curriculum development.

The pre-service teachers did report the collaboration, which took place during student teaching, helped them work through the negative experiences. They indicate that collaboration took place with various audiences throughout the student teaching semester, but primarily with their cooperating teacher, other student teachers, and other agriculture teachers around that state. Interestingly, many also collaborated with their former high school agriculture teachers on a regular basis. They believe the collaborative efforts during student teaching were sufficient, but lacking in other aspects of the teacher preparation program. This can be support by Vygotsky’s Sociocultural Theory (1962) which implies where true collaboration takes place learning will occur.

It was recommended that teacher preparation programs develop collaborative opportunities throughout the collegiate experience, not just during the last semester of student teaching. This collaboration should occur early and often in their experience to allow preservice students to connect with current agricultural educators through professional development and networking opportunities throughout the undergraduate program. Arranging collaborative activities with current agriculture teachers at various district and state events, such as at Career Development Events or the annual summer Agriculture Teachers Conference, should be explored. Tschannen-Moran (2001) found teachers experience higher levels of trust when they collaborate. A collaborative opportunity with others establishes a network of individuals for student teachers to feel comfortable with sharing ideas and seeking input from. This would be beneficial to pre-service teachers prior to beginning their student teaching experience.

Delay and Washburn (2013) suggest collaboration also has a positive impact on a teacher’s career satisfaction and can potentially lead to an increased agriculture teacher retention rate. As we are currently experiencing a deficit of highly qualified agriculture teachers (Smith, Lawver, & Foster, 2017), increasing teacher collaboration could be a key component in a comprehensive teacher retention plan. It is highly suggested teacher educators explore additional ways to enhance collaborative efforts for agriculture teachers through digital or electronic forums and social media as this is becoming a mainstream communication method. Continued research in these area should be conducted with other student teachers to see if similar themes emerge with a larger or more diverse audience.

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**An Examination of the Questioning Habits of Pre-Service Teachers when Planning for Student Learning**

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Introduction

Questions used by teachers in the classroom to facilitate learning can influence the way students engage with the content and how well they learn the material (Chin, 2004). Cotton found teachers spend between 35-50% of their time in the classroom questioning their students (2001). With such a significant amount of time being devoted to questioning, it’s important teachers utilize questioning strategies effectively.

While controversy exists over the exact definition of a question as a teaching method, Sanders, defines a question is any task requiring cognitive action that necessitates the student produces an answer and is not necessarily worded in the form of a statement followed by a question mark (Sanders, 1966). Most researchers agree higher-order, divergent questioning strategies yields higher student achievement (Croom & Stair, 2005; Ornstein & Lasley, 2004; Lustick, 2010). Higher-order questioning can be defined as requiring students to transform data in order to craft a response and be able to justify it (Redfield & Rousseau, 1981). Divergent questions are broadly defined as questions allowing students to take new perspectives on topics using their own information (Gallagher & Aschner, 1963). These questions train students in efficient reasoning skills they will need to be productive members of society (Elder & Paul 1997).

Conceptual Framework

High-order, divergent questioning strategies are the most successful questioning techniques for increasing student learning (Croom & Stair, 2005; Ornstein & Lasley, 2004; Lustick, 2010). Pre-service teachers have been shown to be more efficient and accurate at categorizing and utilizing questions at a higher level after instruction on Bloom's *Taxonomy of Educational Objectives* (Newton, 1969). Additionally, studies revealed pre-service teachers exposed to microteaching and peer teaching methods during training utilized higher order questions more frequently than their peers who were exposed to observation and peer-lecture-discussion groups throughout their students teaching experience (Sounders et al., 1976).

The conceptual framework of this study utilizes the question structure founded in Gallagher & Ascher (1963). The structure separates questions into four main categories: cognitive memory, convergent thinking, divergent thinking, and evaluative thinking. They refer to questions causing students to process given information in some way and range from very close-ended questions to very-open-ended questions. Cognitive memory questions require only simplistic recall of factual information previously presented to the students. Convergent memory requires the students to take information they have learned and manipulate it in a predictable way. Divergent thinking questions allow students to take an undetermined path based off of very little information when answering a question. Evaluative thinking requires student to choose between two or more options and justify their opinion in a scholarly manner. Evaluative thinking differs from divergent thinking because students are asked to provide their own opinion *and* justify their answer. There is no right or wrong answer to these questions, only better or worse answers (Elder & Paul, 1997). These four question types all require student thought processing at various levels.

Purpose/Objectives

The purpose of this study is to describe and investigate questioning habits of pre-service teachers in planning for student learning by exploring the types of questions planned, throughout their Teaching Methods course. By exploring the questions posed in their lesson plans throughout their [Teaching Method] course, including pre-instruction, during instruction and initial experience, and post-instruction based. Three objectives were developed to structure the research:

1. Describe the change in the total number of questions posed by pre-service teachers in lesson plans pre-, during, and post-instruction and experience.
2. Describe the types of questions posed by pre-service teachers in lesson plans developed over the course of a semester enrolled in a teaching methods course.
3. Describe the change in types of questions posed by pre-service teachers in lesson plans pre-, during, and post- instruction and experience.

Methods

This study analyzed the lesson plans of 18 pre-service teachers in an ex-post-facto pre-post design. All lesson plans created by 18 of the students who were enrolled in Methods and Materials in Teaching Agriculture were analyzed. The sample was a census of the 2017 Methods and Materials in Teaching Agriculture course, which included one of the researchers. In order to prevent bias, the researcher was removed from the sample population, providing a 94.7% participation rate. Of the 18 students enrolled, 78% were female and 67% were seniors with 33% as juniors. All participants were exposed to the same conditions over the course of the semester long class.

The course was structured around different teaching methods. Each lesson focused on one of the seven teaching methods; demonstration, lecture, questioning, discussion, cooperative learning, inquiry, and individual application (Roberts, Stripling, & Estepp, 2010). The professor elected to combine lecture with questioning and lecture with discussion so students taught six lessons in the model classroom and a final lesson at their host site at the end of the semester. Students were expected to incorporate what they had previously learned into each following lesson. Students received multiple forms of instruction on each method, watched 2-3 lessons demonstrating use of the teaching method, prepared a lesson plan focusing on the use of the specific method, received instructor feedback on their lesson plan, and taught the lesson to their peers.

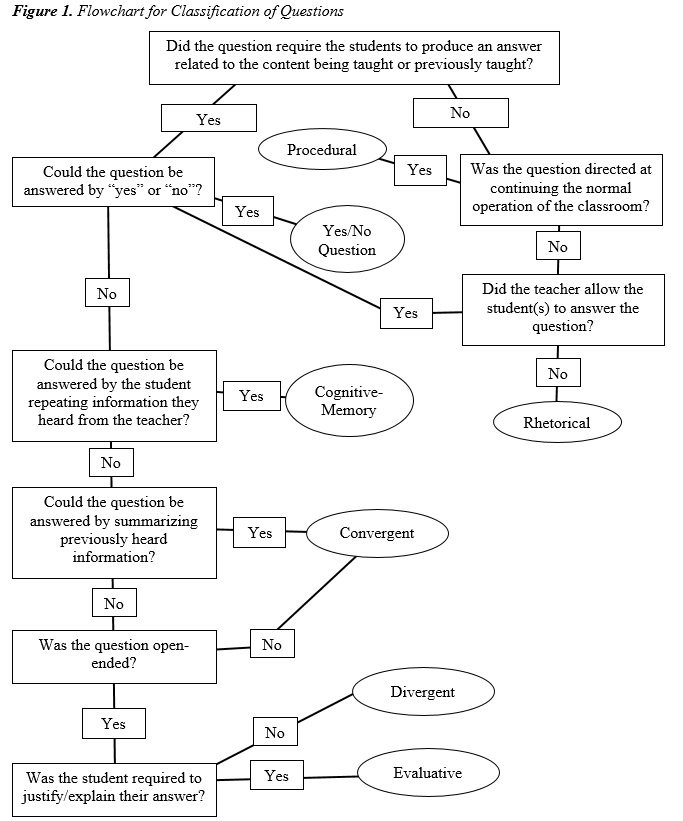
The plans were then placed into three categories based on the learning that had occurred by the pre-service teachers at the time of teaching: pre-instruction, during instruction, and post-instruction. ‘Pre-instruction’ included lessons one and two. These lesson plans were developed before any specific instruction on questioning had occurred. Lesson three was categorized as during because the lesson was aimed at focusing on questioning as a teaching method. Lessons four th

rough seven were categorized as ‘post-instruction’ because students had received instruction on questioning prior to the development of these lesson plans. Any question posed by the participant in their lesson plan was highlighted and coded into at least one of the 5 questioning categories (cognitive memory, convergent thinking, divergent thinking, evaluative thinking, procedural, yes/no questions, or rhetorical).

The researcher utilized the reviewed literature to formulate a flow chart of questions to be used to categorize questions posed by pre-service teachers. The flow chart (See Figure 1) consisted of questions related to the nature of the question and the nature of the assumed answer. The researcher established the basis for this chart at the beginning of the project but modified it slightly to be more inclusive. The use of the flow chart increased the reliability of the coding method. Two additional faculty utilized the flow chart to categorize questions from lesson plans to ensure reliability of coding.

***Figure 1.***

*Flowchart for classification of questions.*



Descriptive statistics were used to describe the types of questions over the course of the semester. The lessons were then grouped and averages for Pre-instruction, During, and Post- Instruction were calculated. Averages for each group were then examined for normality and were then log transformed. The number of questions were then analyzed with paired-samples t-test to determine whether there was a statistically significant mean difference between the pre-instruction lessons to during, during to the post-instruction lessons, and the pre-instruction to the post-instruction. Only two groups were compared at the instead of all three due to degrees of freedom restrictions to avoid type one error. This-test was followed by an F-test to determine if the differences in the timing (Pre- Instruction, During, or Post-Instruction) were different among the types of questions.

**Findings/Results**

The first objective was to describe the types of questions posed by the preservice teachers in their lesson plans. See Figure 1 to see the total number of questions asked over the course of the semester. Pre-instruction the average number of questions was 6.3 (L1=4.5, L2=8.1), during instruction the average number of questions was 13.4, while post instruction the average decreased to 6.1 (L4=7.6, L5=5.2, L6=6.0, L7=5.7).

**Figure 2.**

*Total Questions per Lesson over the Course of the Semester*.

To help describe the specific types of questions asked the totals of each type of questions were analyzed (see Table 1). Cognitive–memory questions showed little change over the course of the semester in terms of the percentage of questions asked. Beginning with 26.7% during pre-instruction, it increased to 28.9% during instruction, and decreased to 24.2% post-instruction (see Figure 2). Convergent thinking began at 15.1% pre-instruction, increased to 21.9% during instruction, and decreased to 14.8% post-instruction (see Figure 3). Divergent thinking questions showed a significant increase throughout the study. Pre-instruction, pre-service teachers utilized divergent thinking questions 22.6% of the time, compared to 29.3% during instruction, and 33.8% following instruction (see Figure 4). Evaluative thinking was utilized the least out of all the questioning categories. Pre-instructions lessons were evaluative 2.7% of the time, during instruction, 3.7% of total questions and 9.0% during post-instruction lessons (see Figure 5). Yes/No type questions decreased in use throughout the study, begging with 16.4% pre-instruction. During instruction, yes/no questions decreased to 9.9% and 9.3% post-instruction (See Figure 6).

Table 1.

*Descriptive Statistics for Types of Questions ab*

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Type of Question | Pre-Instruction | | |  | During Instruction | | |  | Post-Instruction | | |
| M | SD | % |  | M | SD | % |  | M | SD | % |
| Cognitive – Memory | 1.69 | 1.28 | 26.7 |  | 3.8 | 3.08 | 28.9 |  | 1.51 | 1.79 | 24.2 |
| Convergent Thinking | 1.06 | 0.87 | 15.1 |  | 2.94 | 2.53 | 21.9 |  | 0.88 | 0.58 | 14.8 |
| Divergent Thinking | 1.08 | 0.91 | 22.6 |  | 3.94 | 3.10 | 29.3 |  | 2.01 | 1.31 | 33.8 |
| Evaluative Thinking | 0.61 | 0.68 | 2.7 |  | 0.50 | 0.71 | 3.7 |  | 0.60 | 0.57 | 9.0 |
| Yes/No Type | 1.06 | 1.06 | 16.4 |  | 1.33 | 1.81 | 9.9 |  | 0.58 | 0.63 | 9.3 |

*Note:* a n=18; b % = percentage of the total questions asked during each lesson.

The following graphs show the occurrence of the five main types of questions across lessons one through seven. Occurrence is represented as a percentage of the total questions asked during each lesson.

***Figure 3.***

*Occurrence of Cognitive-Memory Questions across Lessons 1-7.*

Pre-Instruction During Post-Instruction

***Figure 4.***

*Occurrence of Convergent Thinking Questions across Lessons 1-7.*

***Figure 5.***

*Occurrence of Divergent Thinking Questions across Lessons 1-7.*

***Figure 6.***

*Occurrence of Evaluative Thinking Questions across Lessons 1-7.*

Pre-Instruction During Post-Instruction

***Figure 7.***

*Occurrence of Yes/No Type Questions across Lessons 1-7.*

Pre-Instruction During Post-Instruction

There was a significant change in the number and type of questions between all three matched pairs of lessons. Overall the number of questions planned by pre-service teachers post instruction changed from before the instruction; *t*(89)=2.84 , *p*=.029. While it also changed between Pre and during (*t*(89)=3.82 , *p*=.007) and between during and post-instruction (*t*(89)=3.46, *p*=0.011). See Table 2 for detailed differences between groups.

Table 2.

*T-test Analysis of Matched Pairs across Groups and Type of Questions ab*

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Pairs | CM | CT | DT | ET | Y/N | Mean Difference | *SEM* | *df* | *t* | *p*-value | *F* | *p*-value |
| Post - Pre | -0.18 | -0.18 | 0.93 | -0.01 | -0.47 | 0.02 | 0.15 | 89 | .07 | 0.94 | 2.84 | 0.02 |
| During – Pre | 2.19 | 1.89 | 2.86 | -0.11 | 0.28 | 1.42 | 0.29 | 89 | 3.95 | .001 | 3.82 | .007 |
| Post - During | -2.38 | -2.07 | -1.93 | 0.10 | -0.75 | -1.41 | 0.28 | 89 | -4.47 | .001 | 3.46 | 0.01 |

*Note: a* n=18*b*CM=Cognitive-Memory, CT= Convergent Thinking, DT= Divergent Thinking, ET= Evaluative Thinking, Y/N= Yes/No type questions.

Discussion & Recommendations

The most significant findings from this study are in the area of divergent questioning habits and total questions compared to quality of questions asked by pre-service teachers. Divergent questioning increased significantly with instruction and experience over time. Overall, there is an increase in utilization of higher-order questions (divergent) compared to lower-order questions (cognitive-memory and convergent thinking). It is also notable that questioning ability continued to increase after initial instruction, suggesting experience benefits pre-service teachers in the development of efficient questioning habits.

Pre-service teachers increased their use of questions when told to focus on questioning as a teaching method. This trend when compared to the improvement in quality of questions indicates students improve the effectiveness of their questioning habits over time with instruction and experience.

The largest limitation to this study is that questioning classification is subjective, especially when questions are analyzed out of context. This limitation was minimized by reading the entire lesson plan and using a flowchart to determine questioning classification. Classification can also be complicated by a large degree of variance in the student population the lesson is being taught to. For example, asking a student with a background in agriculture to provide an example of a use of hydroponics may be classified as a convergent question because it is drawing from previous knowledge while asking the same question to a student without an agricultural background may be a divergent question because the student isn’t familiar with the topic and has very little background knowledge. Also, questions written in the lesson plan were not always clearly worded as to their intent and lesson plans varied in length, detail, and completeness.

The following recommendations can be made regarding furthering research into pre-service teacher questioning habit:

* More research should focus on determining effective strategies for increasing evaluative thinking questions used by pre-service teachers.
* Further studies should examine the effectiveness of specific teaching methods on questioning habit (lecture, peer microteaching, feedback sessions, example lessons, question classification activities, etc.)
* Additional inquiry into how types of instruction and content of instruction benefits questioning ability versus the effects of experience on questioning ability could greatly advance pre-service teacher education.

The following recommendations are developed from this study for teacher educators:

* Students should be encouraged to continually incorporate questioning into their lessons to develop effective questioning habits.
* Pre-service teachers need more focused practice with implementing evaluative thinking strategies into their instruction.
* Pre-service teachers automatically revert to low-order, cognitive memory questions when told to focus on questioning in their lessons. Instruction on incorporating questions into lesson should be focused on incorporating higher-order questioning strategies.

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**Concurrent Session F**

**Room: Farm Credit Services of America Classroom**

**Session Theme: Youth Organizations**

**Discussant: Dick Joerger, University of Minnesota**

**Facilitator: Caitlin Pauley, Michigan State University**

**A Comparison of Youth Perceptions Regarding Entrepreneurship in Pennsylvania and Nicaragua**

Michael Cahill, Daniel Foster, John Ewing, Dan Azzara

**Perceptions of Barriers Limiting FFA Agriscience Fair Participation**

Eric Koehlmoos, Gaea Hock

**Comparing Student Engagement and Achievement between Career and Technical Student Organizations and Other Extracurricular Activities**

Courtney Miller, Adam Marx

**A Comparison of Youth Perceptions Regarding Entrepreneurship in Pennsylvania and Nicaragua**

Michael Cahill

Daniel Foster

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# Introduction

Most of the research conducted concerning entrepreneurship utilizes populations consisting of current entrepreneurs or university students. There is a gap in the literature for pre-university students and youth (Gorman, Hanlon, & King, 1997). Filion (1994) argued that the ideal time to introduce basic concepts regarding entrepreneurship is during adolescence and that “high school is the most determinant level in the development of young people’s entrepreneurial potential” (p. 68). As Supervised Agricultural Experiences (SAE) are an integral part of secondary agricultural education in the United States and provide experiential learning opportunities for students to engage in entrepreneurial activities, there is a need to study agricultural students who have an entrepreneurship-type SAE (Phipps, Osborne, Dyer, & Ball, 2008).

Entrepreneurship is influenced by national culture (Hayton, George, & Zahra, 2002; Wenneberg, Pathak, & Autio, 2013). Collectivistic and individualistic societies play different roles in the development of entrepreneurs with entrepreneurial behaviors typically being more strongly associated with individualistic societies (Wenneberg, Pathak, & Autio, 2013). This study was designed to explore and describe students’ and teachers’ entrepreneurial self-efficacy (ESE) from two different cultures. Entrepreneurial self-efficacy is an individual’s belief in their ability to successfully complete tasks associated with entrepreneurship. The two populations were selected to compare the ESE of students and teachers from two different cultures. The first population consisted of Pennsylvania agricultural students and teachers. The second consisted of teachers and students enrolled at the Fabretto organization’s rural secondary education program in rural Nicaragua. The Fabretto organization is a non-government organization based in Nicaragua that endeavors to bring educational services to primary and secondary students living in rural communities of Nicaragua. Agriculture and entrepreneurship are emphasized in the curriculum.

Peterman and Kennedy (2003) found that entrepreneurship education can significantly increase perceptions regarding desirability and feasibility of pursuing entrepreneurial endeavors. School-based agricultural education is in a unique position to prepare students to be entrepreneurs. The study sought to explore students’ and teachers’ ESE, perceptions regarding entrepreneurship, and inclinations to pursue business with the intention of identifying areas where entrepreneurship education and teacher professional development can increase their ESE and improve perceptions regarding entrepreneurship.

# Theoretical Framework

The theoretical framework for this study was based on Bandura’s self-efficacy theory (1977) and Ajzen’s theory of planned behavior (1991). Performance accomplishments, vicarious experiences, verbal persuasion and emotional arousal influence an individual self-efficacy, an antecedent to entrepreneurial intentions. Entrepreneurial intentions are influenced by an individual attitude toward entrepreneurship, subjective norms, and perceived behavioral control. Ultimately, though outside of the scope of this research, entrepreneurial intentions lead to entrepreneurial action.

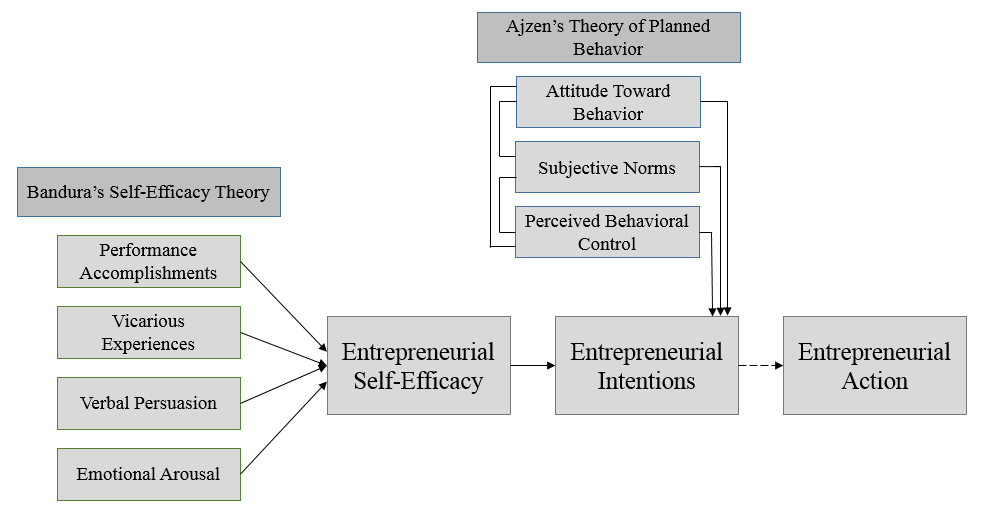


Figure 1 – Theoretical Framework. The theoretical framework draws on Albert Bandura’s self-efficacy theory (1977) as well as Icek Ajzen’s theory of planned behavior (1991) and integrates them into an entrepreneurial process model.

# Purpose and Objectives

The purpose of the study was to describe secondary agriculture student and educator entrepreneurial self-efficacy, perceptions regarding entrepreneurship, and inclinations to pursue business in both Nicaragua and Pennsylvania. The following objectives guided the study:

1. Describe Pennsylvania secondary agricultural students’ entrepreneurial self-efficacy, perceptions regarding entrepreneurship, and inclinations to pursue business.
2. Describe Nicaraguan secondary agricultural students’ entrepreneurial self-efficacy, perceptions regarding entrepreneurship, and inclinations to pursue business.
3. Describe Pennsylvania secondary agricultural educators’ entrepreneurial self-efficacy perceptions regarding entrepreneurship, and inclinations to pursue business.
4. Describe Nicaraguan secondary agricultural educators’ entrepreneurial self-efficacy, perceptions regarding entrepreneurship, and inclinations to pursue business.
5. Examine relationships between demographic variables and entrepreneurial self-efficacy, perceptions regarding entrepreneurship, and inclinations to pursue business.

# Methods

A descriptive survey design was used to identify secondary agriculture teachers’ and students’ ESE, perceptions regarding entrepreneurship, and inclinations to pursue business. Data was collected from the populations in Pennsylvania through Qualtrics and the survey was administered in person by the researcher in Nicaragua. A random sample 500 Pennsylvania agricultural students were selected from a frame which consisted of all students who had active entrepreneurial-type SAEs with records in the Agricultural Experience Tracker (AET) to participate of which, 119 (24%) completed the survey entirely. A frame of Pennsylvania agricultural teachers indicated a census of 244 teachers, of which 75 (31%) completed the survey. Nicaraguan student and teacher participants were chosen by purposeful sampling with 48 students and 17 teachers completing the survey questionnaire. Radhakrishna (2016) stated that in the social sciences, a response rate of 30% for mailed surveys was acceptable and that web-based surveys were acceptable at lower rates.

To collect data, the researcher used a previously developed survey questionnaire that included three constructs. The first construct was developed by McGee, Peterson, Mueller, Sequeira (2009) which measures ESE. The construct is comprised of six dimensions that measure different aspects of entrepreneurship including: searching, planning, marshalling, implementing-people, implementing-financial, and attitude toward venturing. Construct validity was determined by previous researchers using factor analysis. The second and third constructs were developed by Dollisso (2010) which measure perceptions regarding entrepreneurship and inclinations to pursue business. Each construct used a five-point Likert-type scale. Content validity was established by a panel of experts at the Penn State University. The instruments were translated into Spanish by the primary investigator and the face validity was established by conducting a cognitive interview with a graduate of the Fabretto organization. Content validity of the instrument in Spanish was established by a panel of experts which included several directors and administrators at the Fabretto organization.

Nonresponse error was addressed by comparing mean scores of early respondents to late respondents as recommended by Linder, Murphy, and Briers (2001). The *t*-test analysis showed no significant difference between the earlier fifty percent of the respondents and the later fifty percent of respondents for each of the three constructs which indicates that it can be assumed that nonrespondents were similar to respondents.

# Findings

Forty-five percent of the Pennsylvania student respondents were male and forty-eight percent were female (seven percent did not disclose their gender). Sixty percent of the Nicaraguan student respondents were female and forty percent were male. Forty-seven percent of the Pennsylvania teacher respondents were male and fifty-one percent were female. Sixty-four percent of Nicaraguan teachers were male and thirty-six teachers were female.

Table 1

*Demographic Information by Population*

|  |  |  |
| --- | --- | --- |
| Population | Frequency | Percentage |
| Pennsylvania |  |  |
| Students |  |  |
| Male | 53 | 44.5 |
| Female | 57 | 47.9 |
| Undisclosed | 9 | 7.6 |
| Total | 119 | 100 |
| Teachers |  |  |
| Male | 35 | 46.7 |
| Female | 38 | 50.7 |
| Undisclosed | 2 | 2.7 |
| Total | 75 | 100 |
| Nicaragua |  |  |
| Students |  |  |
| Male | 19 | 39.6 |
| Female | 29 | 60.4 |
| Total | 48 | 100 |
| Teachers |  |  |
| Male | 11 | 64.7 |
| Female | 6 | 35.3 |
| Total | 17 | 100 |

All populations were asked to respond to three constructs. The first, ESE consisted of twenty-two items, the second, perceptions regarding entrepreneurship, consisted of eleven items, and the third, inclinations to pursue business, consisted of ten items. The overall mean score for the Pennsylvania students’ ESE was 3.8, perceptions regarding entrepreneurship was 4.2 and inclinations to pursue business was 3.8. The overall mean score for the Pennsylvania teachers’ ESE was 3.9, perceptions regarding entrepreneurship was 4.2 and inclinations to pursue business was 3.5. The overall mean score for the Nicaraguan students’ ESE was 4.0, perceptions regarding entrepreneurship was 3.9 and inclinations to pursue business was 3.7. The overall mean score for the Nicaraguan teachers’ ESE was 4.1 perceptions regarding entrepreneurship was 4.5 and inclinations to pursue business was 3.0. Table 2 shows these findings in more detail. The post-hoc reliability analysis indicated that the Cronbach’s Alpha reliability coefficient for each of the populations and each construct ranged from good to excellent with alphas ranging from .8 to .9 (Robinson, Shaver, & Wrightsman, 1991).

Table 2

*Mean scores of Each Population for each Instrument and Dimension*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Instrument Constructs and Dimensions | PA Teachers | PA Students | Nicaraguan Teachers | Nicaraguan Students |
| Entrepreneurial Self-Efficacy (Total) | 3.9 | 3.8 | 4.1 | 4.0 |
| Searching | 3.9 | 3.7 | 4.0 | 3.9 |
| Planning | 3.4 | 3.5 | 3.8 | 3.7 |
| Marshalling | 3.8 | 3.8 | 4.0 | 4.0 |
| Implementing - People | 4.3 | 3.9 | 4.2 | 3.8 |
| Implementing - Financial | 3.7 | 3.6 | 4.1 | 4.0 |
| Attitude Toward Venturing | 4.3 | 4.3 | 4.9 | 4.9 |
| Perceptions of Entrepreneurship | 4.2 | 4.2 | 4.5 | 3.9 |
| Inclinations to Pursue Business | 3.5 | 3.8 | 4.0 | 3.7 |

*Note.*  Responses to the statements on the ESE scale were scored as follows: Very confident = 5; Confident = 4; Neutral or unsure = 3; Slightly confident = 2; Not at all confident = 1, with the exception of 'Attitude Toward Venturing' which was scored on a polar adjective scale. Statements on the Perceptions and Inclinations scale were scored as follows: Strongly agree = 5; Agree = 4; Neutral or unsure = 3 Disagree = 2; Strongly disagree = 1

Relationships between the constructs and population and gender were examined to identify any significant differences. Independent samples *t*-test analyses were performed to identify significant differences between student and teachers populations as well as gender within populations. Findings indicated that Pennsylvania students had significantly higher *Perceptions Regarding Entrepreneurship* than Nicaraguan students with a Cohen’s *d* effect size of 0.46 (medium). Nicaraguan teachers had significantly higher *Perceptions Regarding Entrepreneurship* and *Inclinations to Pursue Business* than Pennsylvania teachers with a Cohen’s *d* effect sizes of 0.75 (medium) and 0.93 (large) respectively. Pennsylvania students had significantly higher *Inclinations to Pursue Business* than Pennsylvania teachers with a Cohen’s *d* effect size of 0.47 (medium). Nicaraguan teachers had significantly higher *Perceptions Regarding Entrepreneurship* and *Inclinations to Pursue Business* than Nicaraguan students with a Cohen’s *d* effect size of 1.24 (large) and 0.66 (medium).

When examining gender as a variable, the only significant difference within the populations was concerning Pennsylvania students’ *ESE* and *Inclinations to Pursue Business.* Female students in Pennsylvania had significantly higher *ESE* and *Inclinations to Pursue Business* with a Cohen’s *d* effect size of 0.47 (medium) and 0.26 (small). Upon further examination of the ESE construct, female students had significantly higher scores in the dimensions of *Implementing – People* and *Implementing – Financial* with Cohen’s *d* effect sizes of 0.49 (medium) and 0.67 (medium).

# Conclusions, Discussions, and Implications

Objectives one through four were to describe the ESE, perceptions regarding entrepreneurship, and inclinations to pursue business of the teacher and student populations in Pennsylvania and Nicaragua. Students and teachers in Pennsylvania and Nicaragua indicated that they were confident in their abilities to successfully perform activities related to starting a business. Mean scores of students and teachers’ *Perceptions Regarding Entrepreneurship* and *Inclinations to Pursue Business* varied more with Nicaraguan teachers having the highest *Perceptions Regarding Entrepreneurship* and Nicaraguan students having the lowest. Nicaraguan teachers had the highest *Inclinations to Pursue Business* and Pennsylvania teachers had the lowest. A study by Heinert (2016) surveyed three exemplary secondary agriculture programs in the U.S. and findings indicated that student population means of ESE ranged from 3.7-3.9 which is comparable to Pennsylvania students’ ESE score mean of 3.8. However, teachers in Pennsylvania had lower ESE compared with teachers in the three exemplary programs, 3.9 to 4.4 respectively. This is most likely attributed to sampling differences. A study by Dollisso (2010) found that agriculture teachers in Iowa had a mean construct score for their perceptions regarding entrepreneurship of 3.08 which indicates that teachers in Pennsylvania (mean score of 4.2) have higher perceptions regarding entrepreneurship than teachers in Iowa. Additionally, Pennsylvania teachers had higher inclinations to pursue business with a mean score of 3.5 compared to Iowa teachers with a mean score of 3.24.

Objective five was to examine relationships between demographic variables and ESE, perceptions regarding entrepreneurship and inclinations to pursue business. Female Pennsylvania students had higher ESE and inclinations to pursue business than male students. There has been a significant increase in female agriculture teachers in the north east region and currently, women make up the majority. Previous studies have indicated that female students generally have lower ESE and intentions to pursue business than males. As more and more female agriculture teachers enter the profession, this may have implications on the development of students’ ESE and entrepreneurial intentions specifically in empowering female students to pursue entrepreneurship. This is encouraging as women entrepreneurs are needed to drive innovation and sustainable economic development in agriculture and in all fields.

Entrepreneurship will continue to play a critical role in both the innovation driven economies such as the U.S. and factor-driven economies such as Nicaragua in providing jobs and driving innovation. Adolescence is an important time for individuals to develop entrepreneurial potential and therefore, appropriate education should strive to encourage students to engage in entrepreneurship by strengthening their ESE through experiential learning opportunities. Agriculture education should not only prepare students to be college and career ready so that they can be effective employees, but also be empowered to be future employers, to create jobs and drive innovation.

# Recommendations

Based on the findings, the following recommendations were made to key local, state, and national leaders and stakeholders of agricultural education:

1. Entrepreneurship education should continue to focus on building students’ self-efficacy as it will play an important role in developing entrepreneurial intentions and behavior.
2. Agriculture teachers should consider focusing on developing core competencies identified by experts and manifested in the dimensions of the entrepreneurial self-efficacy scale, namely searching, planning, marshalling, implementing-people and implementing-financial.
3. Future research in agricultural education should address other demographic variables beyond gender such as gender-role orientation, age, school setting (urban/rural/suburban). Additionally, research regarding the influence of having an entrepreneurial-type SAE on entrepreneurial entry.
4. As the *Entrepreneurial Self-Efficacy, Perceptions Regarding Entrepreneurship,* and *Inclinations to Pursue Business* scales have been translated to Spanish and their validity and reliability have been established, future research should survey other populations in Latin America to compare findings.

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**Perceptions of Barriers Limiting FFA Agriscience Fair Participation**

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**Introduction/Literature Review**

Agricultural companies are reporting a shortage of graduates in STEM fields while the number of positions in the STEM fields is expected to grow (Goecker, Smith, Fernandez, Ali, & Theller, 2015). Science fair projects have the potential to influence students’ career choice into a STEM related field (Dutton & Sorenson, 2016; Sahin 2013; Schmidt, 2014). In addition to increasing career interest, competing in a science fair project may help in areas such as creative thinking, public speaking, and organizational skills (Murie, 2015).

A method of teaching students to think like a scientist and a way to add scientific rigor in an agricultural science classroom is through scientific inquiry. Washburn and Myers (2010) stated scientific inquiry is when students perform their own experiments and derive their own conclusions and explanations based on their own data. Students taught via inquiry-based instruction had higher scientific reasoning scores (Thoron & Myers, 2012) and most students enjoy doing lab activities (Thoron & Burleson, 2014).

One of the best ways to facilitate scientific inquiry is with the completion of a research project. The FFA Agriscience Fair is “designed for students interested in scientific principles and emerging technologies in the agricultural industry” (Agriscience Fair Program 2017-2021, 2016, p. v). Students enjoy completing science fair projects because it helps satisfy curiosity (Dionne et al., 2012) and they enjoy the competition (Dutton & Sorenson, 2016).

Teacher motivations play a key role into student’s participation in competition and leadership activities. Russell, Robinson, and Kelsey (2009) found teachers motivate students to participate in CDE’s in several ways. Previous experience with the CDE and the tradition of a successful chapter are primary motivations for why a program participates in a certain event (Voigt, Talbert, McKinley, & Brady, 2012). In Kansas, there is not an established tradition of success with the FFA Agriscience Fair. The state has had four projects recognized as a national finalist in the last three years (National FFA Organization, n.d.).

Student motivation to participate in activities outside the classroom is influenced by several factors. In a study by Jones (2013), both extrinsic and intrinsic motivation played a primary role in motivating a student to participate in a Career Development Event. He also stated the FFA advisor plays a key role in recruiting potential students to participate in a CDE (Jones, 2013). Another study reported that extrinsic motivations and keeping the tradition of an FFA chapter are reasons why students participate in a particular CDE (Ball, Bowling, & Bird, 2016). The studies cited above all deal with CDEs and not specifically the FFA Agriscience Fair program.

There are potential negatives of science fair projects and students completing an individual research project. In a study of science fair participants, Schmidt (2014) reported some students develop negative perceptions of STEM coursework. Some science fair projects utilize college laboratories and the guidance of professors (Murie, 2015) which can lead to an uneven playing field where wealthy, elite students have clear advantages over others (Korkmaz, 2012).

AAAE research priority #3 states the need to have a “sufficient scientific and professional workforce that addresses the challenges of the twenty-first century” (Stripling & Ricketts, 2016, p. 29.) This emphasizes the need for scientists and researchers in STEM fields. A possible way to help address this need is through inquiry-based education and completion of an agriscience research project.

**Theoretical Framework**

The expectancy-value theory of motivation (Fishbein & Ajzen, 1975) served as the theoretical framework for this study. As we examine barriers to participation the expectations people have for success is a frame of interest. “Expectancies are people’s beliefs and judgments about their capabilities to perform a task” (Schunk, Pintrich, & Meece , 2008, p. 44). The value piece of the theory focuses on the rationale a person may have for participating in a certain activity (Schunk et al., 2008).

**Purpose and Objectives**

Despite the benefits of the FFA Agriscience Fair, Kansas has had very low participation in this event. In an effort to better understand the barriers and rationale for not participating, a research study was conducted in Kansas. There were three specific objectives for this research study.

1. Investigate the barriers limiting agriscience research by Kansas agriculture programs.
2. Investigate the reasons why Kansas agriculture teachers do not have students participate in the FFA Agriscience Fair.
3. Identify ways to increase participation in the Kansas FFA Agriscience Fair.

**Methodology**

This study examined barriers to participation in agriscience research and the FFA Agriscience Fair by Kansas agriculture teachers. A researcher developed survey was distributed to all Kansas agricultural science teachers (*N* = 223) via Qualtrics in January 2017. A response rate of 35% was obtained (*n* = 79). Of the survey participants, 51.9% were male (*n* = 41), and 48.1% were female (*n* = 38). The majority of participants were between the age of 31 and 35, which an average teaching experience of between 6 to 10 years.

The survey consisted of qualitative and quantitative components. The qualitative responses are the focus of this research paper. Teachers responded to four open-response questions in regards to their perceptions of barriers toward agriscience research and the FFA Agriscience Fair. The responses were analyzed for common themes using the constant comparison method.

Research rigor (trustworthiness) in qualitative research is established through credibility, transferability, dependability, and confirmability (Lincoln & Guba, 1985). The findings of this research were gathered via open-ended questions as a piece of a larger survey. Efforts were made to establish trustworthiness, but there are limitations due to the data collection tool used. Also, the results may not be generalized as only Kansas agriculture teachers were surveyed.

**Findings**

Research objective 1 investigated the barriers limiting agriscience research by Kansas agriculture programs. The major finding for this objective was the lack of time to facilitate, write, and present the research. One respondent stated, “*It takes a lot of time. Everyone involved needs to commit to spending a great deal of time planning the study, gathering data, writing the report and preparing the presentation.*”

Another theme was the struggle to get students motivated to complete a project. “*Keeping kids motivated to continue on a project that has delayed gratification*” [is a struggle]. This theme ties into student motivation with their time commitments. One teacher responded, “*Time, and adding more to a very full program and over committed students.”*

This finding tied into the third theme of experience. “*I don’t know enough about it. It’s hard to get kids motivated to do it if I don’t know how to help them.”* The lack of experience of agriculture teachers to assist their students with a research project was a major finding. *“I am not sure where to start, or how to get students interested.”* This theme was echoed by another respondent, who stated, *“The obstacles would be knowing what I am doing and then helping my students to do research correctly. Also keeping them focused and moving in the right direction.”* This obstacle was connected to knowledge and teacher confidence. One teacher stated, “*Confidence in adequately preparing students to conduct research and then display it.”*

In the experience area, some respondents went further in describing where they lacked specific knowledge to support their students’ research endeavors. These areas included problems with “*selecting valid topics*” that students can research and how to execute the research project through its entirety. One teacher commented, “*Finding a student that wants to complete the paperwork that follows the conclusion of the research project.”* Additionally, one responded that a challenge exists in *“bridging the gap between my knowledge and the kids understanding of scientific method.”*

The final theme in regards to barriers is the lack of appropriate resources. Several teachers commented on the struggle to *“[Find] the equipment to complete something.”* Another teacher commented, “*most high school Ag programs are not equipped to perform scientific research, lacking incubators, lab supplies etc.”* Teachers commented that the lack of facilities, space, materials, and funding necessary to facilitate student projects were all barriers limiting their ability to conduct agriscience research.

Research objective 2 investigated the reasons why Kansas agriculture teachers do not have students participate in the FFA Agriscience Fair. Many of the reasons agriculture teachers do not have students participate in the FFA Agriscience Fair were the same as why they are not conducting research in their programs. They responded that the lack of time, “*It takes a great deal of time. Students tend to burn out and loose interest in the middle of the experience”;* low student motivation, “desire to conduct research is not evident”; and little or no experience with the event, “*don't know much about it*” were all reasons why they have not participated in the competition.

Several teachers explained lack of knowledge about the event and not knowing *“how to go about getting started”* and “*how to get a project done with students*” kept them from participating. Another commented, *I simply haven't looked at the expectations because I am busy with other obligations.”* This lack of awareness about the fair, included where and when it occurred: “*New to the state and didn't know what, when or where [the event is held].”*

Another theme emerged as to years of teaching. A few teachers indicated they were in new programs or in their first few years of teaching and were still trying to acclimate to teaching and running their program. *This is only our second year as a program, so we are still learning about all of the ways to participate.”*

The final theme involved the lack of agriscience research in the program and therefore they are not interested in competing in the FFA Agriscience Fair. One teacher commented, *“I don't incorporate research projects in class and have yet to have students show interest in the agriscience fair.”*

Other programs do have research integrated, but are not able to present the research at the state competition for a variety of reasons including the lack of interest “*in following through with the [agri]science fair.”*

Research objective 3 sought to identify ways to increase participation in the Kansas FFA Agriscience Fair. While many teachers did not have advice to offer due to never participating in the event, others did provide suggestions. Several teachers addressed the need to increase the awareness of the event in an effort to increase participation. Teachers suggested, *“increased visibility”* of the event, *“make sure you get students up to see it. That way it might spark an interest.”* The respondents suggested the need for increased marketing of the program and more communication as to “*deadlines*.”

The need for professional development for both teachers and FFA members was mentioned. “*I'd like to see inservice at our summer and mid-winter conferences on how to implement into our classrooms.”* One teacher suggested, *“workshops at district FFA contests for students to learn more information about it.”*

Teachers requested assistance with “*helping develop ideas for students that are unique as well as challenging.”* They also wanted to be reassured of the basics such as knowing “*that ‘cheap’ poster board will work.”*

One teacher observed, *“If we want participants, we have to make research projects a much bigger part of our agriscience curriculums.”* The need to emphasize how it can be integrated into the curriculum, rather than added onto, was mentioned by several teachers.

*I think the perception is that it is harder to do than it really is. It is easy to incorporate in to classes and not be another "thing to do". I would suggest have trainings for teachers, particularly new instructors, on how to help students with the projects.*

Additional comments ranged from offering “*student grants to be involved*,” “*more prizes*,” and creation of “*How To*” videos. A few teachers commented that the timing of the event was not conducive to participation and suggested it be moved to be a “*stand alone event*” or held “*at state CDEs*.”

**Conclusions/Recommendations**

‘Lack of time’ was the most commonly noted barrier in regards to agriscience fair participation. It takes an extended period of time for a student to develop their project, test their research question, and write up the results. A majority of that time must come outside of a regularly scheduled class period. A few teachers responded that due to their school’s small enrollment, most of their students are involved in many activities. This makes it hard to motivate students to develop a project in addition to all of their other commitments. Encouraging more research-based SAEs can help to communicate how a research project can also serve as a student’s SAE. (Swinehart, 2014). This could also help increase the number of students who have a high-quality SAE program.

Another aspect of the “lack of time” is in regards to the curriculum already taught in the program. In order to address a lack of time in the curriculum and take advantage of the strengths of conducting agriscience research there is a need for more focus on scientific inquiry and allowing a student to develop a project that interests them (Schmidt, 2014; Washburn and Myers, 2010). A teacher needs to budget time in their curriculum to teach the scientific method, how to conduct agriscience research, and analyzing/reporting the results. Utilization of the Curriculum for Agricultural Science Education (CASE) serves as a way to integrate more inquiry-based methods into the agriculture education classroom (2017). In addition, the agriscience fair is an individual or two-person team project; therefore, it requires the teacher to dedicate time advising students in a more individualized manner than typically done in a classroom setting. This additional time requirement serves as a barrier, especially to teachers who are not experienced with facilitating research projects.

Teacher motivation is an essential part of supporting and encouraging student participation in agriscience research (Dutton and Sorenson, 2016; Jones, 2013). Targeted programs to increase interest, motivation, and ability of both teachers and students are necessary. Many teachers noted their lack of knowledge about agriscience research and the FFA Agriscience Fair. This inability to establish a tradition of excellence in the FFA Agriscience Fair decreases both teacher and student motivation to compete in this program (Ball et al., 2016; Russell, Robinson, & Kelsey, 2009; Voigt, Talbert, McKinley, & Brady, 2012). Due to the low participation in the event, there is not pressure in the state for teachers to prepare students to conduct research. This lack of a subjective norm forms a perceived barrier to participation, which leads to low participation in the Kansas FFA Agriscience Fair. Professional development should be offered to improve teacher’s ability to teach the scientific method and motivate their students to conduct research.

There is a need to train preservice teachers to supervise and support agriscience research projects. In 2016, there were 772 graduates in agricultural education across the nation, with 569 of them entering an agricultural science program (Smith, Lawver, & Foster, 2017). Educating preservice teachers on the different aspects of conducting agriscience research could prove valuable in slowly increasing the number of projects in the FFA Agriscience Fair. Teaching future teachers how to facilitate research could also help them write inquiry-based lessons and assignments as well as assist them in becoming more comfortable teaching inquiry-based curriculum.

Teachers in this study commented on the costs associated with conducting agriscience research. There are many potential costs that can develop from a agriscience research, ranging from sophisticated equipment to having the lab space needed for a project. This is a noted issue in science fair literature (Korkmaz, 2012; Murie, 2015). Efforts need to be made to reduce the costs and provide a more level playing field for all students to participate in agriscience research.

A potential way to decrease costs for an agriscience project is to collaborate with school science departments. Science departments may have the equipment and the space needed to perform these experiments. However, even though both science and agriscience teachers believe that collaboration between the two departments is beneficial, it is seldom done (Stephenson, Warnick, & Tarpley, 2008).

We need to continue to address the expectations and values tied to conducting agriscience research and participating in the FFA Agriscience Fair in an effort to meet the demand for agricultural scientists. As we work to increase the number of students who pursue STEM careers, the integration of agriscience research in our agriculture programs is a possible avenue to meet the demands of the industry (Dutton & Sorenson, 2016; Sahin, 2013; Schmidt, 2014). More research is needed to determine the best interventions and methods for increasing the number of students who pursue a STEM career after graduation. Additionally, research is needed to determine the impact of participating in the FFA Agriscience Fair in regards to career choice, scientific reasoning, and critical thinking.

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**Comparing Student Engagement and Achievement between Career and Technical Student Organizations and Other Extracurricular Activities**

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**Introduction**

Student engagement is a measure of how invested students are in their learning (Axelson, 2010) behaviorally, emotionally, and cognitively (Fredricks, Blumenfeld, & Paris, 2004). These facets represent different layers of the learning process and are needed for students to achieve what could be considered model student engagement (Jimerson, Campos, & Greif, 2003; Klem & Connell, 2004; Skinner, Furrer, Marchand, & Kindermann, 2008). Behavioral engagement results in students attending class, participating in extracurricular activities, and displaying positive behaviors (Appleton et al., 2006). Emotional engagement results in students displaying enjoyment, curiosity, and acceptance (Appleton et al, 2006; Jimerson, Campos, & Greif, 2003; Trowler, 2010). Cognitive engagement results in students willingly putting forth effort to excel at learning content because the student believes the learning is relevant and valuable (Appleton, et al. 2006; Trowler, 2010). Student motivation is an important internal component of motivation because it keeps students’ attention on content and, ultimately, keeps them engaged in the classroom (Barkley, 2010).

Extracurricular involvement fosters student success because students who participate in extracurricular activities have higher student achievement and engagement in school than students who do not participate in extracurricular activities (Eccles & Barber, 1999; Eccles, Barber, Stone, & Hunt, 2003; Kronholz, 2012; Lipscomb, 2007; Massoni, 2011). This is partly because the skills and behaviors learned in extracurricular activities can be positively correlated to student achievement, as measured by grade point average, since extracurricular activities prime students for engagement in school (Eccles & Barber, 1999; Eccles, Barber, Stone, & Hunt, 2003). Furthermore, extracurricular involvement increases student motivation in school via positive peer pressure from other students in those extracurricular activities (Reeves, 2008). The fear of being ostracized by the student’s peers is more likely to motivate the student to act than the fear of being reprimanded by an adult (Reeves, 2008). Extracurricular activities dependence on teamwork and peer accountability ultimately help keep students accountable for their actions and decisions within the classroom which can ultimately lead to their engagement and achievement in school.

Extracurricular activities include a plethora of choices that students can participate in beyond the immediate school hours (Eccles & Barber, 1999; North Dakota Department of Career and Technical Education, 2016; North Dakota High School Activities Association, 2016). The “breadth” (meaning number of activities) and “intensity” (meaning number of hours spent in the activity weekly) of extracurricular activities affect the degree of influence extracurricular involvement has on achievement and engagement because these activities require a greater time commitment than those that do not (Farb & Matjasko, 2012, p. 5). Still, research is still unclear on what specific characteristics or components of extracurricular activities lead to student engagement and student achievement (Eccles, Barber, Stone, & Hunt, 2003; Farb & Matjasko, 2012; Fredricks, 2012).

When examining the benefits of FFA, students who participate in FFA develop leadership skills, life skills, job skills, and content knowledge related to other school subjects (Johnson, 1991; Ricketts, Duncan, & Peake, 2006; Wingebach & Kahler, 1997). These research findings align with the National FFA’s Code of Ethics, which indicates that FFA promotes the future success of its students (National FFA Organization, 2017, p. 26). However, little empirical evidence exists that specifically links student engagement or academic success to student involvement in the National FFA Organization. Because previous research reports the positive relationship of extracurricular activities to positive student engagement (Eccles, Barber, Stone, & Hunt, 2003; Fredricks, 2012) and because of these claims to this positive relationship by the FFA, this lack of empirical data needs to be addressed.

**Theoretical Framework**

This study utilized the Expectancy-Value Theory (Wigfield & Eccles, 2000) to help explain the relationship between student participation in extracurricular activities and engagement and achievement in school. Within the present study, the researcher was interested whether or not long-term engagement and achievement in school is affected by extracurricular activities. The researcher proposes that different types of activities provide different levels of either value or expectancy in school because of the difference in connection to classroom material. For instance, sports have relatively no direct connection to classroom material, band and choir can connect directly to those classes (band and choir) and some humanity type classes, and Career and Technical Student Organization(s) (CTSOs) can connect to science, math, humanities, Career and Technical (CTE), and even some areas in the humanities such as public speaking. Using the expectancy-value model of achievement, “goals and self-schemata, subjective task value, and expectation of success” are the focus of this study (Wigfield & Eccles, 2000, p.69).

**Purpose and Hypotheses**

The purpose of this study was to examine the relationship between specific extracurricular activities and the outcomes of student achievement and student engagement. The researchers hypothesized that students involved in different types of activities would have different levels of achievement and engagement because the relationship with school content in extracurricular activities such as CTSOs would provide those participants with additional learning experiences that would lead to help promote student engagement which would result in higher achievement. The following research objectives guided this study:

**Objectives**

1. Describe student involvement in extracurricular activities.

2. Describe student engagement: emotional, behavioral, and cognitive.

3. Compare student self-reported achievement and engagement scores between students involved in Career and Technical Student Organization (CTSO) extracurricular activities and other groups of extracurricular activities.

**Methods/Procedures**

This study examined the relationship between the dependent variables of achievement and engagement and independent variable of student extracurricular involvement using the lens of the expectancy-value theory (Wigfield & Eccles, 2000). Because this was an exploratory study, the researchers opted to utilize a survey design that asked participants to complete a paper questionnaire to gain participants’ perceptions of their extracurricular activities, engagement, and academic success.

Two instruments were used to measure student engagement— the Student Engagement Instrument (SEI (Appleton, Christenson, Kim, & Reschly, 2006) Engagement vs. Disaffection with Learning: Student-report Instrument (EvD) (Skinner, Kinderman, & Furrer, 2009). Student engagement was examined through the constructs of behavioral engagement, emotional engagement, and cognitive engagement. The SEI examined the constructs of emotional engagement and cognitive engagement. The researchers chose to utilize the four-factor model in order to reduce total number of items while retaining reliability. The four factor model includes 14 cognitive engagement items— control and relevance of school work (rα= 0.80) and future aspirations and goals (rα= 0.78) — and 15 emotional engagement items— teacher-student relationships (rα= 0.80) and peer support for learning (rα= 0.82). This instrument utilizes a 4-point Likert-type scale ranging from 1 (strongly disagree) to 4 (strongly agree). The EvD examined emotional and behavioral engagement. The instrument utilized the five behavioral engagement items (rα= 0.71) and five behavioral disaffection items (rα= 0.65) and report the mean, as well as the five emotional engagement items (rα= 0.83) and the twelve emotional disaffection (rα= 0.84) and reported the mean. This instrument utilizes a 4-point Likert-type scale ranging from 1 (not at all true) to 4 (very true). Although both instruments included emotional engagement, findings from the EvD were included in the analysis while the SEI was excluded. The researchers chose not to merge and average due to slightly different scales. Student achievement is measured by the students’ self-reported overall grade point average(s) (GPAs) and highest self-reported ACT scores. Students were asked to self-report both of these scores; however, the researchers were not able to verify the accuracy of the self-reporting.

Student extracurricular involvement was defined to participants as clubs or sports that they were involved in during previous 12 months to which they dedicated at least 20 hours a year. Participants were asked to self-report from a master list that was compiled from activities recognized by the North Dakota High School Activities Association as well as the North Dakota Career and Technical Education Student Organizations. Space was provided for participants to also include activities not listed. All components were combined into one questionnaire.

After IRB approval was obtained, of the six schools that were asked to participate, only three school administrators agreed to participate in the study. The purposive sample included 237 possible participants. These schools were chosen purposely on the criteria that they contained a school population of more than 100 high school students, currently possess an established agricultural education program, and are considered a “Class B” school. From those schools, only junior and senior students were asked to participate as these students would be able to provide the greatest range of activities participated in and dedicated to among high school students. Further, they would be able to provide self-reported ACT data, where younger students would not. These selection criteria were used to ensure a variety of extracurricular activities were available to be sampled, to ensure selection of a variable of interest were included, and because this is considered the normal school size for this state.

Active parental consent was not sought; however, with administration help, letters were sent to the students’ parents to inform them of the study and allowed the parents to opt their child out of the study. Participants were also provided the opportunity to opt out of the study the day of the instrument administration. Data was collected at each school during the spring 2017 semester. The data was analyzed using the SPSS software including means, standard deviations, and t-tests were run to compare groups.

**Findings/Results**

From the three research sites, 191(*n*) students completed the survey from the available sample of 237 students, and a total of four surveys were excluded from the results of the study due to completion errors or response set. Non-response error was not calculated or considered in accordance with the design of the study. Therefore, the results of this study are not generalizable beyond the sample discussed herein.

The sample description consisted of 49.70% juniors (*n* = 95) and 43.50% seniors (*n* = 83), 12 students did not provide answers. Males comprised 49.70% (*n* = 88) of the sample with 47.50% females (*n* = 84), and 2.8% other (*n* = 5). Among the students who reported having FFA membership at some point in time, the largest category for years in FFA was 5 years (*n* = 27, 14.10%), followed by four years (*n* = 24, 12.60%), and three years (n = 23, 12.00%). Among those reporting FFA membership, most reported participating in Career Development Events (CDE) on a state level (46.10%, *n* = 41), followed by never (32.60%, *n* = 32.6), and chapter (7.90%, *n* = 7). Ag among those reporting FFA membership, most of the sample’s highest FFA degree obtained was the Chapter Degree (45.30%, *n* = 34), followed by Greenhand Degree (28.0%, *n* = 21), and State Degree (25.30%, *n* = 19).

**Research Objective One**

Research Objective One was to describe student involvement in extracurricular activities. The extracurricular activities were condensed into different categories for the purposes of analysis (see Table 1). The three categories with the most participants were one CTSO (*n* = 82, 42.90%), multiple sports (*n* = 73, 38.20%),and FFA (37.70%, *n* = 72). However, it is important to note that these categories are not mutually exclusive; therefore, some participants fell in multiple extracurricular activity categories.

|  |  |  |
| --- | --- | --- |
| Table 1  *Student Involvement in Extracurricular Activities* | | |
| **Extracurricular Activity Category** | ***n*** | **%** |
| One Sport | 43 | 22.50 |
| Multiple Sports | 73 | 28.20 |
| One CTSO | 82 | 42.90 |
| Multiple CTSO | 8 | 4.20 |
| FFA | 72 | 37.70 |
| 4-H | 17 | 8.90 |
| School Academic Clubs | 58 | 30.40 |
| The Arts | 49 | 25.70 |
| Other | 16 | 8.40 |
| Sports Statistician | 11 | 5.80 |
| Rodeo | 2 | 1.00 |
| No Involvement Indicated | 26 | 13.60 |

**Research Objective Two**

Research Objective Two was to describe student emotional, behavioral, and cognitive engagement. Respondents reported emotional engagement as the lowest (*M* = 2.63, *SD* = 0.59), next cognitive engagement (*M*= 2.75, SD = 0.52) and the highest being behavioral engagement (*M*= 3.02, *SD* = 0.51) for the entire sample (*n* = 186).

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Table 2  *Student Engagement Levels (n=186)* | | | | |
|  |  |  | **Range** | |
| **Variable** | ***M*** | ***SD*** | **Min** | **Max** |
| Cognitive | 2.75 | 0.52 | 1.00 | 4.00 |
| Emotional | 2.63 | 0.59 | 1.00 | 3.80 |
| Behavioral | 3.02 | 0.51 | 1.00 | 4.00 |
| *Note*. The emotional and behavioral constructs used a four-point Likert scale (1= not at all true, 2= not very true, 3= sort of true, 4= very true). Cognitive engagement used a different four-point Likert scale (1= strongly disagree, 2= disagree, 3 = agree, 4= strongly agree). | | | | |

**Research Objective Three**

Research Objective Three was to compare student self-reported achievement and engagement scores between students involved in CTSO extracurricular activities (which includes FFA, FCCLA, FBLA) and other groups of extracurricular activities. Using Levene’s test for equality of variances, equal variances were assumed because the 2-tailed significance test indicated a normal distribution (p>0.05). Students who did not indicate involvement in a CTSO activity reported slightly higher GPA scores (M= 3.33, SE= 0.49) than students who reported involvement in a CTSO activity (M= 3.29, SE= 0.65). This difference was not significant n t(164) = 0.36, p> 0.05. However, students who reported involvement in a CTSO activity reported higher ACT scores (M= 22.17, SE= 4.03) than students who did not report involvement in a CTSO activity (M= 21.84, SE= 0.40). This difference was also not significant t(157) = -0.51, p> 0.05.

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| --- | --- | --- | --- | --- | --- | --- | --- |
| Table 3  *Comparison Between CTSO And non-CTSO Achievement Scores* | | | | | | | |
|  | ***N*** | **M** | **SD** | **SE** | **T** | **Df** | **Sig. (2-tailed)** | |
| GPA  CTSO  No CTSO | 87  79 | 3.29  3.33 | 0.65  0.49 |  | 0.36 | 164.00 | 0.72 |
| ACT  CTSO  No CTSO | 85  74 | 22.17  21.84 | 4.03  3.99 |  | -0.51 | 157.00 | 0.61 |

Students who did not report participation in a CTSO activity had higher mean score of perceived engagement for all constructs as opposed to students who reported participation in a CTSO activity. Students who did not indicate participation in a CTSO activity reported higher emotional (*M=* 2.64, SD= 0.58), behavioral (*M*= 3.05, SD= 0.55), and cognitive engagement (*M*= 2.76, SD= 0.54) than students who did indicate participation in a CTSO activity (emotional *M=* 2.62, SD= 0.61; behavioral *M=* 2.99, SD= 0.46; and cognitive *M=* 2.75, SD= 0.49). However, according to the independent samples *t*-test, none of the differences in the groups’ data were statistically significant (p > 0.05) for any of the constructs. Therefore, within the present sample, the data from students who reported participation in a CTSO activity did not have a statistically different perceived engagement in school.

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| --- | --- | --- | --- | --- | --- | --- | --- |
| Table 4  *Perceived Engagement for Students With and Without Participation in CTSO Activity* | | | | | | | |
|  | **n** | **M** | **SD** | **SE** | **t** | **Df** | **Sig. ( 2.tailed)** |
| Emotional  CTSO  No CTSO | 89  97 | 2.62  2.64 | 0.61  0.58 |  | 0.21 | 184 | 0.83 |
| Behavioral  CTSO  No CTSO | 89  97 | 2.99  3.05 | 0.46  0.55 |  | 0.79 | 184 | 0.43 |
| Cognitive  CTSO  No CTSO | 90  98 | 2.75  2.76 | 0.49  0.54 |  | 0.09 | 186 | 0.93 |

**Conclusions**

Although the results were not statistically significant, the results are still relevant within Career and Technical Education (CTE) and CTSOs. For this sample, CTSO participation (primarily comprised of FFA members) produced similar engagement and achievement results as participation in non-CTSO activities within these high school systems. Therefore, students from these schools should not be discouraged from participating in CTSO activities for fear of lack of student engagement or achievement. Though the results are not generalizable across the population of high school students, they highlight the difference between students who participate in multiple sports, and students who participate in multiple CTSO activities. A larger number of the respondents who indicated participation in sports reported participation in multiple sports (n = 73, 62.93% of sports participation); however, very few of the students who indicated participation in a CTSO activity, reported participation in multiple CTSO activity (n = 8, 8.88% of CTSO participation). This difference could stem from the smaller actual number of CTSO activities available to students. However, 70% of the students who indicated involvement in a CTSO activity also indicated being involved in a sport (n = 63). This is interesting because it sheds light on the amount of overlap between extracurricular involvement present in small schoos. Small schools lack the student numbers of larger schools and consequently, depend on student involvement in multiple areas in order to compete in the various extracurricular activities. Had this study included larger schools, perhaps the students would not have been involved in as many extracurricular activities.

When examining Expectancy-Value Theory’s role in extracurricular activities, the intracurricular relationship between CTSOs and the classroom had little effect on the students’ engagement and achievement. Therefore, a marginal level of difference of engagement and achievement between the two types of extracurricular activities (CTSO and non-CTSO) were found. While the model does not completely fit for CTSO, it did demonstrate for the broader group that participation in extracurricular activities showed a difference in achievement and engagement. This research does highlight the impact that all extracurricular activities can have for the students that participate in them.

**Recommendations**

We recommend that future research look at how students decide which extracurricular activities to participate. This could help inform research why there was such a difference in the number of students who participated in sports versus those who participated in CTSOs. We also recommend that future research continues to examine the educational outcomes between different types of extracurricular activities as this allows parents and students to make informed decisions regarding extracurricular activity participation. While this study focused on student engagement and achievement, research on other outcomes such as interpersonal skills, or teamwork would give a clearer picture of extracurricular activities that provide meaningful experiences to their students.

**Discussion/Implementations**

This research does open the conversation as to what the goals of extracurricular activities are and should be. It also can begin the conversation within the agricultural community as to what can be done to set student involvement in the National FFA Organization apart from other extracurricular activities besides career exploration that has an immediate benefit for students who do not have an interest in agriculture. While it is unrealistic for every student in every school that offers CTSO activities to have 100 percent school membership, this research does beg the question as to what sets FFA among other CTSOs apart from the other extracurricular activities available in schools.

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