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2010 Western AAAE Research Conference
Research Paper Review Process

The 2010 Western AAAE Research Conference Paper Call was disseminated at the 2009 Western Region AAAE Conference in Lake Tahoe, NV. The call was revised, based on the publication of APA 6th Edition, and re-disseminated through the AAAE list serve and the AAAE website in October 2009. Paper submission deadline was January 11, 2010.

Researchers and authors submitted 40 papers for the 2010 Western AAAE Research Conference. The papers were scrubbed of personal identifiers and then assigned to reviewers through the FastTrack system. The blind peer review process was expected to take three weeks, but due to various factors, the process took closer to six weeks. Each paper was blind-reviewed by a minimum of three individuals registered within the FastTrack system as reviewers.

Reviewers rated the papers on the 69 point scale of the system and noted a level of agreement/disagreement for acceptance. Once received, review data were coded and analyzed. Based on the AAAE system, the aggregated point's *z* score was one-third of the final paper score and the aggregated rating *z* score was two-thirds of the final paper score. The 24 papers with the highest final *z* scores were selected for presentation at the 2010 Conference. This represented a 60.0% acceptance rate. Submission authors were notified by email on February 25, 2010 of the paper acceptance or rejection. The email messages included the Reviewers' comments.

Appreciation is expressed to Dr. David Doerfert at Texas Tech University, for his technical assistance and advice on working within the FastTrack system. Additionally, Dr. Doerfert provided the spreadsheet template for scoring the reviewed papers as well as considered advice as a previous research conference co-chair.

We also express gratitude to Vern Luft and Brian Warnick for sharing knowledge, lessons learned, and conference set-up details. A very special thanks to the reviewers who are the true professionals among our ranks. They stepped up to initially review two papers each, then many took on additional review responsibilities when we anxiously asked for additional reviewers.

The graduate assistants in the MSU Division of Agricultural Education, Eric Larsen, JoLynn Miller, Michelle Passmore and Katie Undem, have played a major role in the organization of the entire conference, from initial planning stages through registration, room set-up, technology management to conference evaluation. Chantelle Mahan, the Division's Administrative Assistant, managed accounts, ordered supplies, and kept us sane in the final days leading up to the conference.

Yet another powerclap of thanks goes to the session chairs and facilitators of the eight research sessions at the 2010 Western AAAE Research Conference. Most importantly, we thank the 131 authors who are informing our practice as they share their research with the profession.

2010 Western AAAE Research Paper Reviewers

Professionalism! It is what makes these conferences possible. Our thanks to the professionals listed below who volunteered their time and expertise in the paper review process.

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Western AAAE Research Conference History

Year	Location	Chair(s)	University
1982	Austin, TX	Gary E. Briers	Texas A&M University
1983	Rio Rico, AZ	Phillip A. Zubrick	University of Arizona
1984	Oklahoma City, OK	David Cox	Cameron University
		James P. Key	Oklahoma State University
1985	Boise, ID	John W. Slocombe	University of Idaho
1986	Las Cruces, NM	Paul R. Vaughn	New Mexico State University
1987	Logan, UT	Gilbert Long	Utah State University
1988	Ft. Collins, CO	Ramsey Groves	Colorado State University
1989	Sparks, NV	Joseph G. Harper	University of Nevada, Reno
1990	Fresno, CA	James G. Leising	University of California, Davis
1991	Seattle, WA	Marvin D. Kleene	Washington State University
1992	Cody, WY	Carl L. Reynolds	University of Wyoming
1993	Bozeman, MT	Van Shelhamer	Montana State University
1994	Honolulu, HI	David E. Cox	University of Arizona
		Frank C. Walton	University of Hawaii
1995	Phoenix, AZ	Glen M. Miller	University of Arizona
1996	Moscow, ID	Jim Connors	University of Idaho
1997	Stillwater, OK	James White	Oklahoma State University
1998	Salt Lake City, UT	Gary S. Straquadine	Utah State University
1999	Corpus Christi, TX	Lance Keith	Texas Tech University
		Jacqui Lockaby	Texas Tech University
2000	Las Cruces, NM	Brenda Seevers	New Mexico State University
		Robert M. Torres	New Mexico State University
2001	Carmel, CA	William Kellogg	Cal Poly, SLO
		J. Scott Vernon	Cal Poly, SLO
2002	Spokane, WA	Michael K. Swan	Washington State University
2003	Portland, OR	Gregory W. Thompson	Oregon State University
		Brian K. Warnick	Oregon State University
2004	Honolulu, HI	Martin J. Frick	Montana State University
		Michael K. Swan	Washington State University
2005	Prescott, AZ	Billye B. Foster	University of Arizona
		Edward A. Franklin	University of Arizona
2006	Boise, ID	Lori L. Moore	University of Idaho
2007	Cody, WY	Carl L. Reynolds	University of Wyoming
2008	Park City, UT	Rudy S. Tarpley	Utah State University
		Brian K. Warnick	Utah State University
2009	Lake Tahoe, NV	Vernon Luft	University of Nevada, Reno
2010	Great Falls, MT	Shannon K. Arnold	Montana State University
		Carl G. Igo	Montana State University

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Examining Secondary Agricultural Educators as Transformational Leaders at the Local Level: A Qualitative Case Study

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Abstract

Agriculture teachers are recognized by students, school administrators, parents, and community members as the leaders of the agriculture program. This case study examined the leadership styles of two agriculture teachers in a high quality secondary agriculture program. The transformational leadership approach of Bass and Avolio provided the framework to explore the leadership styles of the agriculture teachers as perceived by those closely associated with the agriculture program. All 15 individuals who participated in the case study provided specific examples of the agriculture teacher's behaviors which align with the four factors associated with transformational leadership. The results of this study suggest that the transformational leadership style of the agriculture teachers was a very positive and effective way to lead. Future research should examine transformational leadership of teachers in a broad (national) sample and evaluate other leadership models which may be beneficial for secondary agricultural education programs.

Introduction/ Theoretical Framework

For decades agricultural education has been making a positive difference in the lives of students and communities across the nation. The opportunities afforded to students enrolled in high quality agricultural education programs are countless; students can gain diverse and practical experience in a hands-on fashion through a wide variety of classroom/laboratory, FFA, and supervised agricultural experience (SAE) activities. The magnitude and degree of agricultural education's impact may be difficult to fully measure; however, it is conceivable that countless individuals have gained competencies through agricultural education that enabled them to become successful members of society. Furthermore, quality agricultural education programs have played a significant role in the leadership development and personal growth of students.

The extent to which agricultural education has a positive impact on students and communities is greatly dependent on the number of high quality programs. The profession has taken note of the importance of this issue evident by the National Council for Agricultural Education's (The Council) "10X15" plan. The goal of the "10X15" plan is to have 10,000 *quality* agricultural education programs in place by 2015 (2007). To accomplish this goal, effort is needed by all who support agricultural education. The quality and success of the program are dependent upon many individuals and factors; however, none carry a greater weight of responsibility for the program than the agriculture teacher(s). Experts may opine that in order to have high quality agriculture programs there must be high quality agriculture teachers leading the way. In fact, Roberts and Dyer (2004) stated, "Creating effective agriculture teachers is imperative for the long-term sustainability of agricultural education programs" (p. 94).

Therefore, determining what is required to become an effective agriculture teacher is extremely important. Several studies (Harlin, Roberts, Dooley, & Murphrey, 2007; Roberts & Dyer, 2004; Rosenshine & Furst, 1971) provide valuable insight on characteristics and competencies needed for effective teaching. Research has shown that the effectiveness of an agriculture teacher is dependent upon their development of personal qualities and leadership skills. Additionally, literature indicates that leadership experiences of the teacher have a positive influence on program quality and leadership development of students (Bell, 1996; Dodson & Townsend, 1996; Dyer & Osborne, 1996; Fritz, 1996; Gliem & Gliem, 1999; Vaughn, 1976; Vaughn & Moore, 2000; von Stein & Ball, 2007). Greiman, Addington, Larson, and Olander (2007) believe that the teacher is the most important person to assist youth in developing leadership through involvement in an agricultural education program.

Agriculture teachers are recognized by students, school administrators, parents, and community members to run and maintain the agriculture program. They are charged with preparing students “for a lifetime of informed choices in global agriculture, food, fiber, and natural resource systems” as well as developing students’ “potential for premier leadership, personal growth and career success” (National FFA Organization, 2008, p. 5). If agriculture teachers seek to effectively develop leadership in others, they must first identify and understand their personal leadership styles (Bass & Avolio, 2004). The teacher’s leadership, whether it be effective or ineffective, will significantly impact students, agriculture program, school, and community.

Studies are needed to examine and describe the behaviors and characteristics of the agriculture teachers who teach in quality agriculture programs. "Understanding the leadership of the agriculture teacher(s) who run(s) a quality program would provide valuable information for the profession" (Hall, Briers, & Dooley, 2009, p. 40). Furthermore, Greiman (2009) suggests that "qualitative research would be helpful to examine the voice of followers and how the leadership style of adults and peers impacted their leadership development" (p. 59). The need for research examining the leadership style of agriculture teachers is clear; selecting an appropriate leadership theory or model can provide a framework and starting point to discover an effective leadership style for agriculture teachers.

The profession has not adopted a particular leadership model or approach for those seeking to enhance their leadership effectiveness as agricultural educators (Hall, Briers, & Rosser, 2009). However, several key points explained below support the logic of selecting transformational leadership described by Bass and Avolio (1994) as an appropriate model for secondary agricultural educators.

First, the transformational leadership approach has been one of the most widely researched and utilized theories in leadership situations. A content analysis in *Leadership Quarterly* by Lowe and Gardner (2001) suggested that one third of the research was about transformational or charismatic leadership. Second, over the past 25 years leaders in military, government, education, manufacturing, high technology, church, correctional, hospital, and volunteer organizations have been studied through the lens of transformational leadership and were reliably differentiated as leaders ranging from highly effective to ineffective (Bass & Avolio, 2004). An additional point made by Boyd (2009) should appeal to those in education:

> using transformational leadership theory as a pedagogical method and teaching philosophy will not only help students operationalize the theory, but will also lead to deeper understanding for students– a transformation of their understanding of themselves as leaders and leadership itself. (p. 51)

Finally, research specific to our profession by Greiman, Addington, Larson, and Olander (2007) suggested that transformational leadership might be advantageous when confronted with issues in the school environment. Their 2007 study utilized the Multifactor Leadership Questionnaire (MLQ) and concluded that agricultural educators are "more transformational in their preferred style in contrast to transactional and laissez–faire styles" (p. 93). Roberts and Dyer (2004) studied an expert panel of agricultural educators in Florida to identify the characteristics of an effective agriculture teacher. One hundred percent of the respondents agreed that an effective agriculture teacher demonstrates personal qualities such as "cares for students, is honest, moral, and ethical" (p. 89). Each of these qualities aligns with the transformational leadership approach; therefore, this approach will be used to examine the leadership style of the agriculture teachers in this study.

The transformational leadership theory explains leadership as a continuum consisting of transformational and transactional factors and a laissez-faire factor. According to Bass and Avolio (1990), transactional leadership results in expected outcomes whereas transformational leadership results in performance beyond expectations. Therefore, this study will focus solely on the four transformational factors.

Transformational Factors

Factor one, *idealized influence* or *charisma,* describes a leader who acts as a strong role model with high morals; followers count on them to "do the right thing" (Bass & Avolio, 1994 p. 3). Factor two, *inspirational motivation,* describes a leader who communicates high expectations and motivates followers to commit to a shared vision, ultimately inspiring a high level of team spirit. Factor three, *intellectual stimulation,* is evident in leaders who encourage followers to be creative, innovative, and willing to challenge personal as well as organizational beliefs; the leader supports followers as they try new approaches to deal with issues and solve problems within the organization. Factor four, *individualized consideration,* consists of a supportive climate in which the leader listens attentively to individual follower needs, advising and coaching the follower toward self actualization (Bass & Avolio).

Purpose of the Study

The purpose of this case study was to examine the leadership styles of agriculture teachers in a high quality secondary agriculture program. The study sought to determine if the leadership styles of the agriculture teachers align with the four factors of the transformational leadership approach (Bass & Avolio, 1994) as perceived by those closely associated with the agriculture program.

Methods/Procedures

Case study research was used to examine the quality of a secondary agricultural education program. “A case study is an in-depth description and analysis of a bounded system” (Merriam, 2009, p. 40). The principal researcher’s experience as a secondary agricultural educator and current work with agriculture programs created a mental model of what constitutes program quality. Then, in this study of one program and its teachers, a holistic picture of the program was gained through semi-structured interviews with 15 participants (Merriam, 2009), all of whom had different but close associations with the program. Participants were interviewed separately/individually to help ensure confidentiality and to encourage honest, detailed responses. The interviews were audio recorded; additional data were collected through observational field notes that included photographs onsite.

Prior to conducting the interviews, the researcher used pilot interviews with several agricultural educators to eliminate confusing questions and to elicit suggestions for additional questions (Merriam, 2009). Additional qualitative methods included observations of the agriculture teachers as they carried out various roles within the program.

Data Collection

The purposive sample for this case consisted of the two agriculture teachers and 13 other individuals associated with the selected secondary agricultural education program; they were purposely chosen to create a holistic representation of the agriculture program. The agriculture teachers were asked to identify possible participants: former students who had graduated from the program, parents of current and former students, faculty and staff from the school, and community leaders. A list of the respondents depicting their connections to the agriculture program is shown in Table 1. In order to protect the identity of each participant, pseudonyms were given; pseudonyms provide an audit trail of each individual’s responses and bring the case study to life. The program was selected purposively based on the following criteria:

a) The agriculture program/FFA chapter was recognized as a “high quality” program by the researcher and a panel of agricultural education experts.
b) The agriculture teachers were recognized as outstanding leaders and effective teachers by the researcher and a panel of agricultural education experts.
c) The school was located in the southeastern United States where the researcher taught agriculture and believed that that connection would foster greater rapport with participants.

Table 1
Participant List

Respondent Pseudonym	Title/Connection to Program
Sue	Parent/ FFA Alumni President
Mrs. Carter	Science Teacher
David	Parent/ FFA Alumni/Former Student
Mr. Wright	Principal/Parent of Current Student
Larry	Former Student/ Valedictorian

Continued next page

Table 1 continued

Respondent Pseudonym	Title/Connection to Program
Jeff	Former Middle School Agriculture Teacher
Mrs. Fields	School Secretary/ Parent of Former Student
Barry	Community Leader/ Former Student/ State FFA President
Meghan	Former Student
Gary	Parent/ FFA Alumni
Lucie	Parent/ FFA Alumni
Mrs. Williams	Guidance Counselor
Ms. Hansen	Agriculture Student Teacher
Mr. Adams	Agriculture Teacher
Mr. Oliver	Agriculture Teacher

Data Analysis and Trustworthiness Measures

The qualitative data were analyzed using "the process of breaking down, examining, comparing, conceptualizing, and categorizing data" (Stauss & Corbin, 1990, p. 61). Semi-structured interviews were audio recorded and field notes were taken throughout the observation and interviewing process. To enhance the credibility of the study, several strategies were utilized by the investigator: triangulation, peer examination, and the clarification of researcher's biases (Merriam, 2009). Triangulation was accomplished through gathering data from a variety of participants and through direct observation by the researcher. "Triangulation using multiple sources of data means comparing and cross-checking data collected through observations at different times or in different places, or interview data collected from people with different perspectives" (Merriam, 2009, p. 216). Peer examinations took place in several meetings with experts who made comments on audio recordings and themes that emerged. The researcher's background and perspectives related to the study were cataloged in a methodological and reflexive journal. All coded data were traced back to the transcripts with an audit trail (i.e., Table 2). Results are presented with representative quotes to give voice to the respondents and provide thick description so that readers can vicariously determine if the results from this case will transfer to their contexts.

Results/Findings

The Context

The selected secondary agricultural education program is located in the southeastern United States in a town with about 7,000 residents. According to the city's chamber of commerce, residents are employed in a variety of industries: health care and social assistance (18%), educational services (11%), retail trade (10%), construction (8%), and agriculture, forestry, fishing, and hunting (8%); the ethnicity of the city comprises 68% White/Caucasian, 28% Black, and 4% Hispanic (Chamber of Commerce, 2009).

There was one high school in the town; there were about 675 students in the high school with about 180 enrolled in the agriculture program. The agriculture program had two agriculture teachers with combined experience of more than 50 years in the classroom. The eight agriculture courses offered were Agriscience Foundations 1, Animal Science and Services 2, 3, & 4, Introductory Horticulture 2, Horticultural Science 3, and Agricultural Sales and Services 2 & 3.

Participants in the study were associated with the agriculture program in multiple ways. Spending time at the school allowed the researcher to observe that the school, community, and agriculture program were interrelated and connected in numerous ways. Students, parents, teachers, and community leaders were connected on multiple levels both personally and professionally. For example, one school employee grew up in the community, knew one agriculture teacher as a family friend, and had a child go through the agriculture program (personal); however, now they are colleagues and work together at the school (professional).

Attention was brought to the interconnected, personal, and professional relationships that exist in this case because throughout the results there was an overlapping and connectedness of themes. The results should be considered from the multiple perspectives in which they were shared. In addition, there is an inextricable bond between the agriculture program and the agriculture teachers. However, this study seeks to focus specifically on the agriculture teachers.

Leadership styles of the agriculture teachers were assessed as perceived by their former students, school faculty and staff, parents of current students, community leaders, and the agriculture teachers themselves. The transformational leadership theory provided a theoretical framework to examine the leadership of the agriculture teachers in the selected program. The four transformational factors—*Idealized Influence, Inspirational Motivation, Intellectual Stimulation,* and *Individualized Consideration*—provided a starting point for the semi-structured questions. Through interviews and observations, several themes and subthemes emerged within each of the four factors; each of the themes and subthemes is explained in relation to the respective transformational factors.

Idealized Influence

Participants described the level at which the agriculture teachers are looked up to and respected by students and others associated with the agriculture program. Three themes: 1) well-respected, 2) family figure, 3) role model, and one subtheme, character, emerged to describe the *idealized influence* of the agriculture teachers.

Numerous comments were made illustrating the level of respect the agriculture teachers have in the school and community. Ms. Hansen, the student teacher interning at the school, spoke of how parents and members of the community see the agriculture teachers; often their comments were, “These are the best guys ever.” Ms. Hansen further explained her perspective, “I have never heard anybody say anything bad about them [Mr. Adams and Mr. Oliver].” A former student, Larry, spoke of this respect as well; he stated, “It is probably the highest that teachers could receive…my personal respect for them is…I respect them as teachers, I respect them as men.” Another comment regarding the respect of the agriculture teachers was shared by Jeff, the former middle school agriculture teacher, “Well, they think Mr. Adams walks on water; I don’t know if I need to say more than that.”

Idealized influence was evident through comments that depicted the agriculture teachers almost as members of the family. A community leader and former student, Barry, believes

> there’s a lot of people that you’d interview that look to Mr. Adams as a father figure, somebody they could entrust… they would talk to him about some things they wouldn’t talk to anybody else about, his advice and the character that he

> upholds everyday in the community is the reason for that and I don't think Mr. Oliver is any different….he has instilled some of those same values.

Larry shared about a friend of his in school who had a rough home life and shared how important the agriculture teachers were for her. "[Mr. Adams] took the father figure role that was void for most of her life and she definitely got extremely close to [Mr. Adams] as well as [Mr. Oliver]."

In addition to being well-respected/family figures, the agriculture teachers were viewed as role models with solid character. Jeff mentioned, "Parents want their kids to have [Mr. Adams and Mr. Oliver] because they do provide such a good role model." Mr. Wright, the high school principal and father of a student in the program, stated, " They [Mr. Adams and Mr. Oliver] are both positive people… the kids really do pay attention to what they say and they [students] take a lot of it to heart." David, an FFA alumni member and former student, was confident that the agriculture teachers have an influence on students and serve as role models. "I definitely think they [students] look up to them and respect them and you know, try to act like them."

The well-respected, family figure, role model was a deliberate and intentional behavior that both agriculture teachers sought to portray. When asked about being someone who is looked up to, Mr. Adams said, "Well, that is something that I have always taken kinda personally, because I think we are role models… all teachers should be role models." He explained, "I think ag teachers are in a unique position to do that because of the relationship that most ag teachers have with their students…. we need to set examples of what is right and what is wrong." The other agriculture teacher, Mr. Oliver, believes, "It's kinda like taking an oath of morals and ethics and living up to it, not just from 8-5…you have to accept a higher level of responsibility." Mr. Oliver concluded, "We [Mr. Adams and Mr. Oliver] take it very seriously, it's not just a job; it's a life."

Inspirational Motivation

Another factor of transformational leadership is *inspirational motivation*. Through interviews and observations specific ways the agriculture teachers motivate students became evident. Four themes, 1) lead by example, 2) the program, 3) developing students' self-esteem, and 4) high expectations, surfaced to show the *inspirational motivation* provided by the agriculture teachers.

Participants described ways the agriculture teachers motivate students through behaviors themed as "lead by example." David spoke of how "their general attitude" motivated students, [Mr. Adams and Mr. Oliver] act like they are genuinely interested in the kids doing good and learning and doing their best." Individuals shared examples illustrating *inspirational motivation;* numerous words were used to show that the example they set motivated others. The "dedication" (Mr. Wright), "encouragement" (Mrs. Fields), "enthusiasm" (Lucie) and "love" (David) for the kids and the program represent the way in which the teachers "lead by example" (Larry and Mrs. Carter).

The program itself serves as a strong motivator. Individuals stated that competitions offered through the agriculture program, the success of the program, and the traditions associated with the program provided a source for the teachers to encourage and push students to do their best. Mr. Wright believes, "One of the things they [Mr. Adams and Mr. Oliver] use to motivate them [students] is past success; obviously you have a program that has a long history of success…in a lot of ways the tradition in itself is a motivator." The guidance counselor, Mrs. Williams, said, "The plaques on the wall, the trophies in the case, their [students] pictures in the paper" challenge students to do well. Sue, a parent and FFA alumni president, spoke of using competitions to challenge students, "Well, [FFA] competitions are a great thing, some of your student are very competitive."

In addition to leading by example and using the program to motivate students, the agriculture teachers develop the students' self-esteem which creates an environment of *inspirational motivation*. Jeff illustrated how one of the agriculture teachers motivates students who may not have the confidence or courage to participate in a competition or activity.

> I think Mr. Oliver does a great job with that because he has taken kids that say "oh I don't want to do this, I don't care about that, I'm not interested in this," but what he does is challenges them to just try it… a lot of times they will do that and they find out they enjoy it… then they become successful at whatever they are doing.

Even though program is very competitive, the teachers "make sure that they [students] feel good about themselves and their success" (Sue). Meghan, a former student, said, "They just make you feel like you needed to do your best."

The high expectation of the agriculture teachers was a final theme that emerged reflecting the *inspirational motivation*. Larry shared from his experience as a student, **"**They had a standard of excellence that they expected you to reach and it was high, but it was not so high that it was unattainable." Jeff believes that the teachers' high expectations motivate students to do their best and it attracts the higher achieving students to the program, "We have had the valedictorians and salutatorians and I think it's because they expect the best from these kids."

Intellectual Stimulation

Another key factor of transformational leadership is *intellectual stimulation*. Through the study several themes and subthemes appeared to illustrate ways the agriculture teachers challenge students to do their best and to think critically. The three themes that support *intellectual stimulation* are 1) FFA events, 2) good teaching skills with hands-on activities as a subtheme, and 3) challenge students with higher-order thinking as a subtheme.

The agriculture teachers encourage and support student planning and participation in FFA events and activities like the FFA banquet and Career Development Events (CDE) (Lucie). Sue shared one benefit of allowing students opportunities through FFA, "The FFA offers plenty of contests that critical thinking skills are involved." The FFA events the students participate in benefit them beyond high school, Mrs. Williams said, "Students come back and tell me FFA prepared them for college more than some of the purely academic classes they were taking [in high school]."

The good teaching skills of the agriculture teachers were voiced by several individuals. Sue stated, "He [Mr. Adams] just has good teaching skills, he is an excellent teacher." The student teacher, Ms. Hansen, believes, "They [Mr. Adams and Mr. Oliver] model what it means to be a good agriculture teacher." Participants shared several reasons they felt the agriculture teachers exemplify *intellectual stimulation.* Individuals spoke of how the teachers did a great job of connecting multiple subjects and topics from multiple classes. Mr. Adams and Mr. Oliver "teach math and science and make them use it in a way that is meaningful" (Mrs. Williams). In Mrs. Carter's science class students often said, "We talked about that down in ag" (Mrs. Carter). When Mrs. Carter, a science teacher comes by to visit the agriculture building she doesn't expect them to be studying out of books, even though she knows they do, she mentioned, "I expect them to be doing all kinds of hands-on things" working in the greenhouse or on a piece of equipment. Mrs. Carter also spoke of the education value of hands-on activities, "they [students] like that …and they remember it [the material being taught] because it's a practical application."

The agriculture teachers challenge students to think for themselves and question what they believe which leads to higher-order thinking. Jeff mentioned the agriculture teachers set high expectations to motivate students, the *intellectual stimulation* is evident as the teachers "challenge them with difficult things...they make the kids work for it." The principal, Mr. Wright, said he observed Mr. Adams in class the other day and he got kids to think, "Why would you do it that way?" Ms. Hansen put it this way, "They do a really good job of asking a lot of those quadrant four type questions; just going beyond basic recall…they play devil's advocate, making them more of what the other side's argument is."

Individualized Consideration

Another factor associated with transformational leadership is *individualized consideration*. Participants spoke of how the agriculture teachers show students that they care about them. The three themes associated with *individualized consideration* are 1) genuine interests/selfless behavior, 2) involved in students' lives, which has two subthemes, nicknames and relationships, and 3) coaching/advising, with two additional subthemes, student potential and discipline.

The genuine interests and selfless behavior exhibited by the agriculture teachers was expressed by Mr. Wright, "They [Mr. Adams and Mr. Oliver] are always giving of themselves…not many teachers would put in the extra time." They "genuinely have an interest in students" (Sue) so the "extra hours that they do for practice with their teams, going to competitions or what have you on the weekends" (Mr. Wright) is all part of their "dedication" to the students and the program. The agriculture teachers expressed as teachers, genuine interest in students should be expected of them. Mr. Oliver believes that "what we are all supposed to be doing is taking a interest in the personal student." Mr. Adams shared his desire that students know the agriculture teachers care. "They need to know that somebody cares about them. This may be the only place on earth that they know somebody cares about 'em. I do care about our kids…I try to convey that to them."

The genuine interest and selfless behavior is the beginning of being involved in students' lives. Individuals spoke of how the agriculture teachers are "a part of their [students] lives" (Sue) and how students share all aspects of their lives with them even if it does not relate directly to the agriculture program. Mrs. Carter mentioned how the agriculture teachers are

> involved in all the things they [students] do…involved in their lives more so than just, well I see you for 50 minutes and you can go on and I'll see you tomorrow for 50 minutes…the program is more involved than just the 50 minutes classroom.

The agriculture teachers are “keeping up with what they [students] do in their lives outside the classroom” (Mrs. Carter). If the students go on trips with church, sports, band, or other groups they will call the agriculture teachers to let them know they arrived safely.

As a result of being so involved in their students’ lives, nicknames and strong relationships have formed. Mrs. Fields shared, “If he [Mr. Adams] likes you and he sees there is something there he can get out of you, he always has a nickname for the student.” The close relationship between teachers and the students was shared by Gary, “Mr. Adams kinda jokes with our son” in a friendly manner. Evidence of the teachers being somewhat like a friend was also shared by Lucie, who said, “Spending so much time with them [Mr. Adams and Mr. Oliver], there is a camaraderie there.” Mrs. Williams believes that the relationships the agriculture teachers develop with their students are very important. Over time “that relationship is built up and on a number of occasions made a difference in a kid’s life.”

Individualized consideration was illustrated by the time the agriculture teachers spent coaching/advising students. The agriculture teachers were willing to listen to and help students with anything and everything they were going through in life. Meghan shared of challenges she faced and the advising she received, “I always had confidence issues and whenever Mr. Oliver would see that I was really having a tough time with something he would say, hey you need to talk? We’d talk…he has always been there for us.” Looking to develop students’ potential and discipline are aspects of coaching/advising that surfaced. Larry said the agriculture teachers have “the leadership ability to recognize some strong traits in some of the students and like help them develop.” Meghan recalls, “Becoming a part of the agriculture program, the teachers’ outlook was “How can we help you further yourself?” Bringing out the best in students required the teachers to discipline students as well. Lucie shared how that influenced her daughter, “she does not want to be seen in a bad light by him, times when she has kinda screwed up, kids stuff, she has not wanted it pointed out or in detail to Mr. Adams.” Mrs. Williams also shared about the teachers’ discipline,

> He [Mr. Adams] will have to come down on a kid hard and that kid leaves the meeting knowing that he has been fussed at, but he also knows the he is loved too… they don’t tolerate a lot of fooling around, but they still maintain a sense of fun and they still convince the kids they are in it for them.

A summary of the transformational leadership factors with supporting themes and the source of each theme are provided in Table 2.

Table 2
Audit Trail of Transformational Factors with Supporting Themes

Themes and subthemes	Source of themes and subthemes
Idealized Influence	
Well-respected	Sue, Mrs. Carter, David, Mr. Wright, Larry, Jeff, Mrs. Fields, Meghan, Mrs. Williams, Ms. Hansen
Role model	Sue, Mrs. Carter, David, Mr. Wright, Larry, Jeff, Barry, Meghan, Mr. Adams, Mr. Oliver
Character	Mrs. Carter, Barry, Ms. Hansen, Mr. Adams, Mr. Oliver
Family figure	Sue, Mr. Wright, Larry, Mrs. Field, Barry, Meghan, Gary, Lucie, Ms. Hansen, Mr. Adams
Inspirational Motivation	
Lead by example	Mrs. Carter, David, Mr. Wright, Larry, Barry, Mr. Adams, Mr. Oliver
The program	Sue, Mr. Wright, Mrs. Fields, Mrs. Williams, Mr. Adams
Developing students' self-esteem	Sue, Jeff, Meghan, Mrs. Williams, Ms. Hansen, Mr. Adams, Mr. Oliver
High expectations	Mrs. Carter, David, Mr. Wright, Larry, Jeff, Mrs. Fileds, Mr. Adams, Mr. Oliver
Intellectual Stimulation	
FFA events	Sue, David, Jeff, Mrs. Fields, Barry, Gary, Lucie, Ms. Hansen, Mr. Adams, Mr. Oliver
Good teaching skills	Sue, Mr. Wright, Larry, Jeff, Mrs. Fields, Barry, Meghan, Gary, Lucie, Mrs. Williams, Ms. Hansen, Mr. Adams, Mr. Oliver
Hands-on activities	Sue, Mrs. Carter, Larry, Barry, Meghan, Mr. Adams, Mr. Oliver
Challenge Students	Sue, Mr. Wright, Larry, Jeff, Mrs. Fields, Meghan, Gary, Lucie, Mrs. Williams, Ms. Hansen, Mr. Adams, Mr. Oliver
Higher-order thinking	Sue, Mr. Wright, Larry, Jeff, Mrs. Fields, Meghan, Gary, Lucie, Mrs. Williams, Ms. Hansen, Mr. Adams, Mr. Oliver
Individualized Consideration	
Genuine interest/	Sue, David, Mr. Wright, Mrs. Fields, Meghan, Mrs. Williams,

selfless behavior	Ms. Hansen, Mr. Adams, Mr. Oliver
Involved in students' lives	Sue, Mrs. Carter, Jeff, Mr. Adams, Mr. Oliver
Relationships	Larry, Mrs. Fields, Barry, Meghan, Gary, Lucie, Mrs. Williams, Mr. Adams, Mr. Oliver
Nicknames	Mrs. Fields, Gary, Lucie, Mr. Adams
Coaching/advising	Larry, Jeff, Mrs. Fields, Barry, Meghan, Gary, Lucie, Mrs. Williams, Ms. Hansen, Mr. Adams, Mr. Oliver
Student potential	David, Mr. Wright, Larry, Mrs. Fields, Barry, Meghan, Mrs. Williams, Ms. Hansen, Mr. Adams, Mr. Oliver
Discipline	Mrs. Carter, David, Mr. Wright, Gary, Lucie, Mrs. Williams, Ms. Hansen, Mr. Adams, Mr. Oliver

Conclusions, Implications, and Recommendations

All of the individuals who participated in the case study shared the perspective that both of the agriculture teachers exhibited each of the four factors associated with transformational leadership. In addition, those associated with the program believe that the agriculture teachers have a strong influence on the quality of the program, the students, and the community. They believe that the leadership of the agriculture teachers is the key component to the success of the program. "There is no doubt that the leader of the program makes all the difference in the world" (Barry).

As a result of this study it is evident that the transformational leadership style of the agriculture teachers was a very positive and effective way to lead. Their impact on the students, agriculture program, school, and community has created a very significant impact that was greatly appreciated by those in the study. This study supports the previous study of Minnesota agriculture teachers claiming transformational leadership may be "advantageous" in the school environment (Greiman, et. al., 2007). In both quantitative and qualitative studies the transformational leadership approach seems to provide a resourceful leadership model for secondary agriculture teachers. However, the effectiveness of other leadership styles is unknown

Additional studies should be conducted not only in individual states, but also on a national scale. Agricultural education is community based; therefore, it would be helpful to see if the transformational leadership approach can help agricultural educators create and sustain high quality programs in all parts of the country. National studies should consider the demographic and programmatic variables associated with the agriculture teacher(s) and their program(s). Then, one could determine if the transformational style of agriculture teachers has any correlation with variables that can be changed or added to create a higher quality agriculture program. Future studies should also consider other leadership models (i.e., authentic leadership, situational leadership, etc.) to determine if other models can help agricultural educators lead more effectively.

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A Regional Comparison of Stress Among Beginning Agriscience Teachers in Central and West Texas

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Abstract

The purpose of this study was to determine if there were regional differences in stress levels of beginning agricultural science teachers in Central and West Texas. Agricultural education professionals included in the study were secondary teachers. The target population for this study was secondary agricultural science teachers in the first or second year of teaching. All forty-eight (n = 48) beginning teachers from two selected regions of the state were identified. A census of the beginning teachers was taken. There was a 52% response among the 48 teachers. Fourteen (n = 14) teachers of the central region and eleven (n = 11) of the western region participated. The Teacher Stress Inventory, a 49-item instrument, was used to measure stress levels (Fimian & Fastenau, 1990). Independent samples t-tests revealed there was a statistically significant difference between the groups on stress related to the time management factor. Western region teachers in the state expressed higher levels of concern for time management stress than the agriscience teachers from the central region of the state. However, other sub-scale factors, including work-related stress, professional stress, professional investment, and discipline did not reveal significant differences. Overall, the beginning agriscience teachers had slight to moderate stress.

Introduction and Theoretical/Conceptual Framework

The teachers involved in agricultural education at the secondary level often face time demands that extend well beyond a typical eight-hour work day. Professional development efforts targeting areas such as job satisfaction, stress, and time management are a reasonable approach to possible burnout, particularly with beginning teachers (McLean & Camp, 2000).

The teacher shortages in our public school system have been occurring at an alarming rate (U.S. Department of Education, 2009). Some school districts employ teachers who lack proper certification due to a shortage of teacher education program graduates who decide to pursue a teaching career. As a result, struggles may occur in the quality of instruction available to students (Camp, Broyles, & Skelton, 2002).

There are national efforts, such as the National Council for Agricultural Education 10 X 15: The Long Range Goal for Agricultural Education, whose goals include growing the number of agricultural education programs from 7,200 to 10,000 by the year 2015 (National FFA, 2008). A goal of more programs increases demand for trained teachers. There is a reported shortage of qualified agriscience teachers (Kantrovich, 2007). Prioritizing teacher recruitment and retention must be an area of focus to attain the goals of the 10 x 15 endeavor. Education research conducted by Ingersoll (2003) reported that staffing problems will not be solved if schools do not address the sources of low teacher retention.

Stress, defined by Maslach (1982), is the body's reaction to change which may be physical or environmental. Maslach, noted for research involving stress and burnout, identified the categorical stages one experiences including emotional exhaustion, depersonalization and reduced personal accomplishment. Working conditions, emotional or physical, cause stress. Elimination of stress as a solution is not possible according to Maslach. Control and prevention of becoming overstressed is the approach. The emotional levels as a result of any occupational strain could lead one to reach a level of frustration or high stress (Maslach, 1982). Consequently, stress ties directly to Herzberg's Two-factor Theory (Herzberg, 1959)

Herzberg, Mausner, and Snyderman (1959) indentified the top six factors which determine job satisfaction: achievement, recognition, work itself, responsibility, advancement, and growth. The top six factors which determine dissatisfaction (hygiene factors) were: company policy, supervisor, relationship with boss, working conditions, salary, and relationship with peers. Herzberg et al (1959) made a distinction between the two domains of job satisfaction was based on Maslow's hierarchy of needs (Maslow, 1943). Working conditions are factors which may cause stress to the beginning teacher, particularly during the first year.

The levels of the first year involve emotional reactions to the experience as modeled in the phases of a first-year teacher as presented by Moir, 2005. The model depicts the trend of the beginning teacher through the traditional academic calendar (see Figure 1).

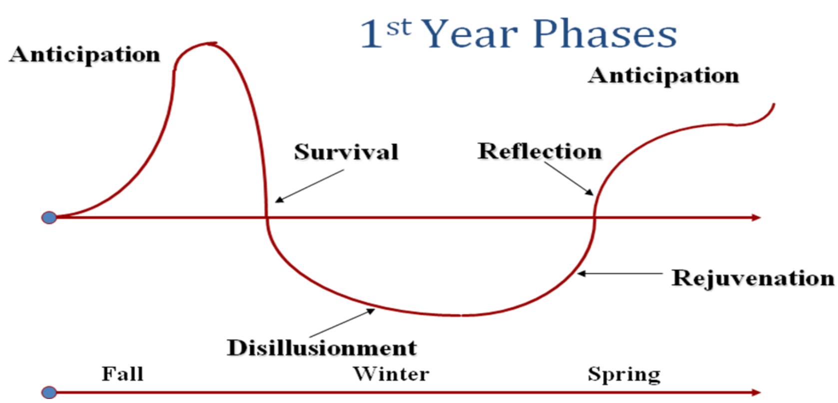

Figure 1. Phases of a first-year teacher (Moir, 2005).

The initial anticipation or elation of securing that first teaching position is soon followed by the anxiety of the reality of the day-to-day demands of the job. The model then depicts an increase toward a more satisfied level of agreement by the teacher as the growing pains of the break-in period begin to subside (Moir, 2005).

Geographical location or regional locale among teacher stress is not present in literature. Agriscience local needs, as a variable, may need attention. Larger states may have regional differences needing consideration among beginning teachers. Pressing issues have surfaced such as managing stress, balancing work and personal life, and time management (Myers, Dyer, & Washburn, 2005). Teacher job satisfaction levels should be addressed by teacher education programs through professional development including work and family balance (Chaney, 2007).

Single regions may need to be measured for the various induction teacher concerns. Research conducted on the inservice needs of agricultural science teachers found that teacher stress and time management were issues needing attention in teacher professional development (Roberts & Dyer, 2004). The statewide sample consisted of both traditional and alternatively certified teachers. Roberts and Dyer found teacher stress and time management as the largest professional development concerns among both of the sample groups.

Castillo and Cano (1999) found that females tend to leave the profession at a greater rate than males. Gender attrition issues may begin to play a considerable role in beginning teacher retention as two studies, Burris & Keller, (2007); and Burris, McLaughlin, Brashears, & Fraze (2008); reported one half of the teachers in studies involving beginning teachers to be female.

The strategy used to resolve or prevent stress and conflict in the agricultural education setting may help retain some quality teachers (Croom, 2003). Croom concluded that as teachers gain experience teaching, they cope to alleviate work-related stress. Croom and Moore (2003) found moderate stress and also reported experience as a coping tool. Stress-causing agents of the workplacehave appeared to be a surprise to beginning teachers. According to Walker, Garton, and Kitchel (2004), assignments on campus are a surprise reality for new teachers at the secondary level. Moreover, a bad experience while student teaching may prevent many university graduates from entering the teaching profession (Osborne, 1992).

The factors which determine stress must be addressed taking a professional development approach (Walker et al., 2004). Torres, Lawver, and Lambert (2009), conducted a study on job-related stress and found that hours per week at work was the largest predictor of stress. Meister and Melnick (2003) concluded that 84% of new teachers reported feeling “overwhelmed by the workload” and recommended that “time management is another area where teacher preparation programs need a greater focus” (p. 92).

Purpose, Objectives, and Hypotheses

The purpose of this study was to determine if regional differences exist in stress levels of beginning agricultural science teachers in Central and West Texas. The following research objectives were used to conduct this study:

- Describe the level of stress of beginning agriscience teachers.
- Determine stress differences between teachers based on regional location of the state.

As a means of accomplishing the second objective of the study, the following null hypothesis was tested:

H_o: There is no difference in scores on stress for beginning teachers from the west region or the central region of the state.

Methods/Procedures

This study employed survey research to describe the stress of the beginning teachers and determine if there are regional differences. According to Fraenkel and Wallen (2006), the cross-sectional survey involves a predetermined population. In this case, the study involved beginning teachers in agriscience. Limitations of this design includes that the study’s design does not control for threats due to individual characteristics (Frankel and Wallen, 2006).

The target population for this study consisted of secondary agricultural science instructors in the first or second year of teaching. Subjects were chosen based on geographical region of the state. The names of the teachers were obtained from the 2008-2009 Vocational Agriculture Teachers Association of Texas (VATAT) data which included years of tenure. The accuracy of the list was confirmed by visiting the individual school district web-based information, email, and telephone contacts. There was a total of 204 (N = 204) beginning teachers in the state. There were 48 (n = 48) beginning teachers in the selected regions. The researcher included all of beginning teachers from the identified regions.

Limitations of this study include sample size and locale. This study included a sample of beginning teachers in only two regions of Texas. It was a fairly small group in comparison to the entire state. Caution should be taken when making any inferences beyond the scope of this study.

The researcher established the time of instrumentation *a priori* based on the Phases of a First Year model (Moir, 2005). The low point of emotional disillusionment occurs at mid-academic calendar, or December. Twenty-three (n = 23) of the beginning teachers in the western region and twenty-five (n = 25) instructors were contacted. The Teacher Stress Inventory (TSI) was used to measure the stress levels (Fimian & Fastenau, 1990).

The procedures for the instrumentation involved web-based questionnaires. Collection of data followed the procedures according to Dillman's (2007) tailored design method. The internet links accompanied by instructions were sent to the teachers along with an explanation of confidentiality of their response. The timeline of the data collection transpired through the month of April. The researcher obtained a 52% response rate. Fourteen (n = 14) of the central region teachers responded and eleven (n = 11) of the western region responded.

Fimian and Fastenau (1990) defined the ten factors of the 49-item TSI: *Professional stress* is how teachers see themselves as professionals. *Behavioral manifestations* are inappropriate ways to deal with stress. *Time management* is the "balancing act" related to teaching. *Discipline and motivation* are aspects of the teacher-student relationship. *Emotional manifestations* are ways that teachers respond emotionally to stress. *Work-related stress* consists of environment-specific events that are sources of stress. *Gastronomical manifestations* are stomach ailments related to stress. *Cardiovascular manifestations* are cardiovascular problems associated with stress. *Fatigue manifestations* are fatigue problems associated with stress. Participants rated each statement on a five-point scale including: *1) not noticeable, 2) barely noticeable, 3) moderately noticeable, 4) very noticeable* and *5) extremely noticeable* (p. 155).

Reliability was reported by a study conducted on 10-year aggregate data collected by the TSI author (Fimian & Fastenau, 1990). The Cronbach's alpha coefficients were greater than 0.75 and overall TSI alpha coefficient of 0.93. Fimian & Fasteneau conducted factor analyses on the TSI to refine the instrument

A brief demographics section including gender and ethnicity was included to describe the beginning teachers. Age was not included in the instrumentation. Mean scores, and standard deviations were used to analyze data which measured stress levels of the 25 (n = 25) agriscience teachers. The null hypothesis was tested using independent samples *t*-tests to compare the two groups' mean scores on the total stress and each of the ten factors of the TSI. The alpha level, which was established by the researcher *a priori*, was set at 0.05 ($\alpha = .05$). Effect size was also calculated using the means and standard deviations to determine the Cohen's *d* coefficient.

Findings/Results

Research Objective 1. Describe the level of stress of beginning agriscience teachers.
There were ten factors or constructs in measuring the level of stress. The stress level of the beginning agriscience teachers was measured by the 49-item Teacher Stress Inventory (TSI) (Fimian & Fastenau, 1990). The mean for the beginning agriscience teachers was $M = 2.95$ (SD = .59). Therefore, the overall stress is *moderately noticeable* stress. Four of the constructs in the TSI measured above the noticeable level on the five-point scale: time management, work-related stressors, discipline and motivation, and professional stress. The TSI data by factor means are depicted in Table 1.

Table 1
TSI Mean and Standard Deviation by Stress Factor

	Total (*n = 25)*		
TSI Factor	*M*	*SD*	Rank
Time Management	3.83	0.77	1
Work-Related Stressors	3.77	0.74	2
Discipline and Motivation	3.56	0.98	3
Professional Stress	3.24	0.91	4
Emotional Manifestations	2.80	1.02	5
Professional Investment	2.78	0.84	6
Fatigue Manifestations	2.77	0.81	7
Cardiovascular Manifestations	1.72	0.73	8
Gastronomical Manifestations	1.50	0.65	9
Behavioral Manifestations	1.27	0.29	10

Note. 1 = Not Noticeable; 2 = Barely Noticeable; 3 = Moderately Noticeable; 4 = Very Noticeable; 5 = Extremely Noticeable.

Research Objective 2. Determine stress differences between teachers based on regional location of the state.
To test the null hypothesis, the summated mean scores on the TSI were compared between the treatment group and the non-treatment group. The researcher compared the equality of means of the scores of the TSI using an independent samples *t*-test, with an alpha level established *a priori* at 0.05 ($\alpha = .05$). According to Kirk (1982), the *t*-test is used to test a null hypothesis when comparing means of two groups.

There was not a significant difference, $t\ (23) = 1.76$, $p = .09$, between the groups on the overall mean scores analyzed using the TSI mean score ($p > .05$). Table 2 displays findings of the independent samples *t*-test in the TSI.

Table 2
Independent Samples t-test - Mean Scores of Beginning Teacher Stress by region

Group	*n*	*M*	*SD*	*t*	*p*
West Region	11	3.17	0.50	1.76	0.09
Central Region	14	2.77	0.62		

To further compare the ten subscale factors of the TSI, independent samples *t*-tests were conducted to compare equality of means by construct between the two groups. The only construct mean scores with a statistically significant difference, $t\ (23) = 2.71$, $p = .01$, was Time Management. Table 3 displays the findings of the independent samples *t*-test for the Time Management factor, sub-construct.

Table 3
Independent Samples t-test - Mean Scores of Beginning Teacher Time Management Stress

Group	*n*	*M*	*SD*	*t*	*p*
West Region	11	4.25	0.50	2.71	0.01
Central Region	14	3.50	0.80		

The researchers elected to compare the mean scores and the standard deviations of the two regional groups of first and second-year agriscience teachers for practical differences on the individual stress factors using Cohen's d coefficients. Thalheimer and Cook (2002) suggested the relative size of Cohen's *d* coefficients to measure effect size for practical differences when comparing two groups. Table 4 displays the different effect sizes based on the Cohen's d coefficients.

Table 4
Relative Size of Cohen's d (Thalheimer and Cook, 2002)

Relative Size	Cohen's *d* Coefficient
negligible effect	(>= -0.15 and <.15)
small effect	(>=.15 and <.40)
medium effect	(>=.40 and <.75)
large effect	(>=.75 and <1.10)
very large effect	(>=1.10 and <1.45)
huge effect	>1.45

The TSI ten factor means and standard deviations by treatment group were analyzed and compared. Table 5 displays the means, standard deviations and effect size for the ten constructs, or TSI factors.

Table 5
A Comparison of Teacher Stress Factors, Effect Size by Treatment

	West		Central		Effect Size	
	n = 11		*n = 14*			
TSI Factor	*M*	*SD*	*M*	*SD*	*Cohen's d*	Effect
Time Management	4.25	0.50	3.50	0.80	*1.10*	Very Large
Emotional Manifestations	3.14	1.17	2.52	0.83	*0.65*	Medium
Work-Related Stressors	4.01	0.45	3.58	0.88	*0.62*	Medium
Professional Investment	3.04	1.02	2.57	0.62	*0.60*	Medium
Cardio- Manifestations	1.90	0.87	1.57	0.59	*0.47*	Medium
Gastronomical Manifestations	1.63	0.69	1.40	0.62	0.37	Small
Professional Stress	3.41	0.94	3.10	0.90	0.35	Small
Discipline and Motivation	3.72	0.97	3.42	1.01	0.32	Small
Behavioral Manifestations	1.31	0.29	1.23	0.30	0.28	Small
Fatigue Manifestations	2.87	0.81	2.68	0.82	0.24	Small

Cohen's *d* coefficients determined a very large effect size for Time Management. Medium effect sizes (>=.40 and <.75) resulted in the four sub-scale factors: Professional Investment, Emotional Manifestations, Work-Related Stressors, and Professional Stress.

The beginning teachers in the group were described according to demographic information including gender and ethnicity. Table 6 displays the demographics for the teachers.

Table 6
Summary of Demographic Data of Beginning Teachers by Treatment Level

	West		Central		Total	
	(*n* =11)		(*n* =14)		(*n* = 25)	
Demographic	*f*	*%*	*f*	*%*	*f*	*%*
Gender						
Female	4	36.4	6	42.9	10	40.0
Male	7	63.6	8	57.1	15	60.0
Ethnicity						
White	11	100.0	14	100.0	25	100.0

The central region of the state contained a slightly higher representation of females with 42.9% of the instructors being female compared to 36.4% in the western region. One hundred percent of the instructors were white, non-Hispanic in ethnicity.

Conclusions, Implications, and Recommendations

This study included a sample of beginning teachers in two regions of Texas. It was a fairly small group in comparison to the entire state. Limitations due to the sample size were a result. Caution should be taken when making any inferences beyond the scope of this study.

Most of the beginning teachers, or two thirds, are male. One third of the teachers are female. Although the majority of this study's participants are male, the female beginning teachers in the group imply that females are becoming more accepted into a traditionally male teaching role. Burris et al (2008) reported half of the beginning teachers in a study were female. The work and family balance retention issues with females may differ from the same issues with male teachers (Castillo & Cano, 1999). Time management as a concern with the agriscience teachers according to gender may be a variable needing exploration. Although females are represented, the ethnicity of the beginning teachers (100% white, non-Hispanic) may be interpreted that there is a possible diversity issue in agricultural education.

The beginning teachers are considered to have low to moderate stress. This finding is consistent with Croom & Moore (2003) who found a moderate level of emotional exhaustion. Four of the TSI factors were *moderate* to *very noticeable,* ranked from highest to lowest, included: time management, work-related stressors, discipline and motivation and professional stress. These findings coincide with Mundt and Conners (1999), Meister & Melnick (2003) and Roberts and Dyer (2004) who found time demands and work load are concerns for beginning teachers. This mid-range level of stress for beginning teachers may not sound alarming. However, mathematically, there were some concerns from beginning teachers which were rated on the *very noticeable* range of the stress index. Time management was one factor where beginning teachers need assistance.

There was not a statistically significant difference in stress levels between the two groups. However, among the ten constructs of the TSI, *time management* was statistically different when comparing the two regional groups. The time management concern implies that the profession should explore possibilities to localize efforts to identify needs of induction teachers. This finding was consistent with Cheney (2007) whose findings included hours working as an attrition concern among beginning teachers. Geographical location and local community demands of a teacher's time may be a concern for teacher retention in this crucial time of securing professionals.

Medium effect sizes indicated minor, practical differences between regions in *professional investment, emotional manifestation, and work-related stress*. These differences, although not statistically significant, show possibility that there is a need to serve induction teachers according to the geographical differences based on these variables. Professional development through state staff and university faculty may need to explore these variables.

It is recommended that stress and time management research, which controls for gender, be conducted. Additionally, gender roles on work and family balance among agricultural science teachers should be explored similar to the study conducted by Cano and Miller (1992). Scholarly efforts in work and family balance should coincide with the national retention efforts in the profession including the National Research Agenda (2007) research priorities.

Teacher education programs should make efforts to teach comprehensive time management to pre-service agriscience teachers. It should be made clear that time management involves much more than organizing activity between school bells. There is also a need for beginning teachers to have a clear understanding of professional roles and the importance of work and family balance.

There is a need to explore ethnicity distribution among teachers in secondary agricultural education. Research involving recruitment and retention of university teacher education programs should examine the levels of diversity among agricultural education student populations along with students' intentions of entering the teaching profession.

This study should be replicated and involve random sampling and a larger sample size of induction teachers, or better yet, a census of the beginning teachers. Research should control for differences such as enrollment, school size, economy, and locale among the sample when measuring stress or work and family balance concerns. Furthermore, experimental and quasi-experimental studies should be conducted to determine effects of professional development seminars addressing induction teacher needs.

This study only involved first and second-year teachers. Further research is recommended to include agriscience teachers of varying tenure and locale. Additionally, investigations of involving comparisons between agriscience teachers and other education professionals with abundant workloads, such as athletic coaches and band directors, should take place using a multi-disciplinary approach.

The agricultural education profession should encourage creative efforts and continue professional development toward induction teachers particularly during that initial wave of the workload shock of the middle of the school year. The use of contemporary methods to reach teachers should be employed in order to include a wider audience when geographical constraints may prevent attendance in professional development seminars.

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A Descriptive Study of Pre-Service Agricultural Educator Teacher Self- Efficacy

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Abstract

The purpose of this study was to describe the teacher self-efficacy of pre-service agriculture teachers. A researcher created survey instrument with four domains: classroom, FFA, SAE and program management was utilized. Participants completed the survey instrument two separate times. Pre-service teachers in this study were predominately female, and had been FFA members. Participants reported favorable perceptions of their teacher preparation program. Individuals who had been FFA members reported higher levels of teacher self-efficacy on both assessments, especially in the FFA domain. Cumulative grade point average was negatively related to teacher self-efficacy, while years as an FFA member was positively related to teacher self-efficacy. Seniors preparing for their student teaching internship reported the greatest increase in teacher self-efficacy between the assessments, while freshmen reported a decrease.

Introduction/Theoretical Framework

Agricultural education faces a teacher shortage. In 2007, Kantrovich estimated a teacher deficit of 38.5%. The agriculture teacher shortage has been a problem for a number of years; "A de-facto 'teacher shortage' has been a constant problem for agricultural education for at least the 40 years covered by this study" (Kantrovich, p. 3, 2007). The Pacific Northwest is not exempt from this shortage. Swan (2009a) found that 27.3% of graduates in Agricultural Education in the Pacific Northwest did not enter the teaching profession. In the 2008-2009 school year, 102 positions in agricultural education were available; of those, only 24 recent graduates entered the teaching profession. Many of the available positions were filled by ". . . alternatively certified teachers, current teachers moving, teachers returning to the profession, and even recently retired teachers" (Swan, 2009a, pg. 6). In Idaho, there were 19 available positions during the 2008-2009 school year; while only 4 graduates were certified to teach (Swan, 2009b). The study of teacher self-efficacy may be a potential solution to the teacher shortage.

The theoretical foundation of this study was grounded in the theory of self-efficacy (Bandura, 1977). Self-efficacy is defined by Bandura (1994) as "people's beliefs about their capabilities to produce designated levels of performance that exercise influence over events that affect their lives" (p. 1). Individuals with a high sense of self-efficacy approach threatening situations with the belief that they can exercise control over the situation and they can overcome obstacles and set-backs (Bandura, 1994). Individual self-efficacy is derived from four main sources: mastery experiences, physiological and emotional states, vicarious experiences, and social persuasion (Bandura, 1994).

The theory of self-efficacy has been applied to teachers and labeled *teacher self-efficacy*. Teacher self-efficacy is defined as "…a teacher's belief that he or she can reach even difficult students to help them learn... it, [teacher self-efficacy] appears to be one of the few personal characteristics of teachers correlated with student achievement" (Woolfolk, 2007, p. 334). The suggestion that a teacher's self-efficacy beliefs are determinants of their success is a deceptively simple, yet powerful idea (Tschannen-Moran & Woolfolk Hoy, 2001). Teachers with high teacher self-efficacy believe students who are unmotivated can still influenced with enough effort. A teacher with low teacher self-efficacy believes there is little they can do to reach unmotivated students, and the teachers influence is limited by environmental factors. A teacher with high teacher self-efficacy would be more likely to create exciting, dynamic, student-centered learning environments where students take ownership of their learning, while a teacher with low teacher self-efficacy would devote more time to managerial-like tasks (Bandura, 1997).

Teacher self-efficacy is related to plans to stay in the profession of teaching (Evans & Tribble, 1986; Darling-Hammond, Chung, & Frelow, 2002). Therefore, to retain teachers, they must believe that they are competent in the tasks they are required to perform as agricultural educators. Assessing this perceived teacher self-efficacy in job-specific tasks, will inform teacher educators about areas in which pre-service and beginning teachers believe they are unable to affect change. Bandura (1986) has established that efficacy develops partly as a result of past experiences. Mastery experiences can be past experiences with a particular task, or experiences related to the task, for example, participation in a youth organization.

Knobloch (2006) found that student teachers who held more positive perceptions of their teacher-preparation programs were more efficacious at the conclusion of their student teaching experience. Whittington, McConnell, and Knobloch (2006) found that students' perceptions of their student teaching experiences were positively related to teacher self-efficacy. Knobloch (2001) reported that early field experiences and teaching peers influenced teacher candidates' sense of teacher self-efficacy suggesting that students become more efficacious about their teaching because they had observed and experienced teaching in real settings and had taught their peers.

Duncan and Ricketts (2006) postulated that the research in agricultural education was limited to general pedagogical topics; therefore, a more specific measure was needed to accurately describe the teacher self-efficacy of secondary agricultural educators. The researchers utilized a modified Borich needs assessment model using the following variables: technical agriculture content, FFA/leadership development/SAE, teaching and learning, and program management. In addition to describing teacher self-efficacy in these areas, the researchers also attempted to differentiate between traditionally and alternatively certified teachers. The results indicated that the traditionally certified teachers felt *somewhat competent* in the technical content construct, and *competent* in FFA/leadership development/SAE, teaching and learning, and program management. Alternatively certified teachers were less efficacious in all areas.

Wolf, Foster, and Birkenholz (2008) assessed teacher candidate's level of teacher self-efficacy and their perceptions of their preparation. Additionally, the researchers investigated the relationship between teacher self-efficacy and professional experiences during the student teaching internship. The researchers found that observing young or beginning teachers, a vicarious experience (Bandura, 1994), was positively related to their sense of efficacy. The amount of feedback candidates received from their cooperating teacher was also positively related to teacher self-efficacy. The researchers concluded that this feedback enabled teacher candidates to refine and improve their instructional strategies. The number of class preparations (the number of different courses students were teaching) at any one time, and the number of total class preparations over the course of the semester were negatively related to teacher self-efficacy. This prompted the researchers to recommend that teacher educators examine the number of classes that candidates are teaching. Bandura (1986) recommended that self-efficacy is built when an individual is successful at a task. It is possible that teacher candidates in this study were overloaded, and were not able to experience success in teaching each course before additional courses were added. The researchers speculated candidates experienced a "point of diminishing returns" (Wolf, Foster & Birkenholz, p. 26, 2008) when they were involved in teaching too many courses.

Wolf and Miller (2009) found that beginning teachers were more efficacious in the classroom domain, when compared with the FFA and SAE domains. Teachers reported the lowest levels of teacher self-efficacy in the SAE domain. The teachers in this study reported favorable perceptions of their teacher preparation program and favorable perceptions of their first year of teaching. Males in this study reported higher levels of teacher self-efficacy than females. Because of the lower scores in the SAE domain researchers recommended that a greater emphasis be placed on preparing teachers for SAE related duties during teacher preparation.

Teacher preparation is an important factor in teacher self-efficacy. Knobloch and Whittington (2002) found that the quality of teacher preparation was associated with student teacher sense of teacher self-efficacy. Ross, Cousins, and Gadalla (1996) found that "feelings of being well-prepared" was associated with teacher self-efficacy. Additionally, Rubecks and Enochs (1991) found teacher self-efficacy was predicted by university coursework related to future teaching requirement. Darling-Hammond, Chung, and Frelow (2002) examined the relationship between perceptions of preparation and teacher self-efficacy and found that ratings of their overall teacher preparedness were significantly related to their sense of efficacy about whether they are able to make a difference in student learning. Teachers in this study who, " . . . felt underprepared were significantly more likely to feel uncertain about how to teach some of their students and more likely to believe that student's peers and home environments influence learning more than teachers do" (p. 294).

Although some research in the area of teacher self-efficacy specific to agricultural educators has been published, no consensus of findings is evident, nor is the literature base in this area extensive. Existing research has been conducted using general measures of teacher self-efficacy, which contradicts the recommendation from Bandura (2006) to address specific components of a required task. "The *'one measure fits all'* approach to measuring teacher self-efficacy usually has limited explanatory and predictive value because most of the items in an all-purpose test may have little or no relevance to the domain of functioning" (Bandura, p. 307).

Woolfolk Hoy and Hoy stated that "One of the things that makes teacher efficacy [teacher self-efficacy] so powerful is its cyclical nature" (p. 168, 2009). The present study addressed two components of the model presented (see Figure 1) by Woolfolk Hoy and Hoy, by assessing teachers' assessment of their teaching competence (their sense of efficacy) and investigating possible demographic characteristics that were associated with teacher self-efficacy.

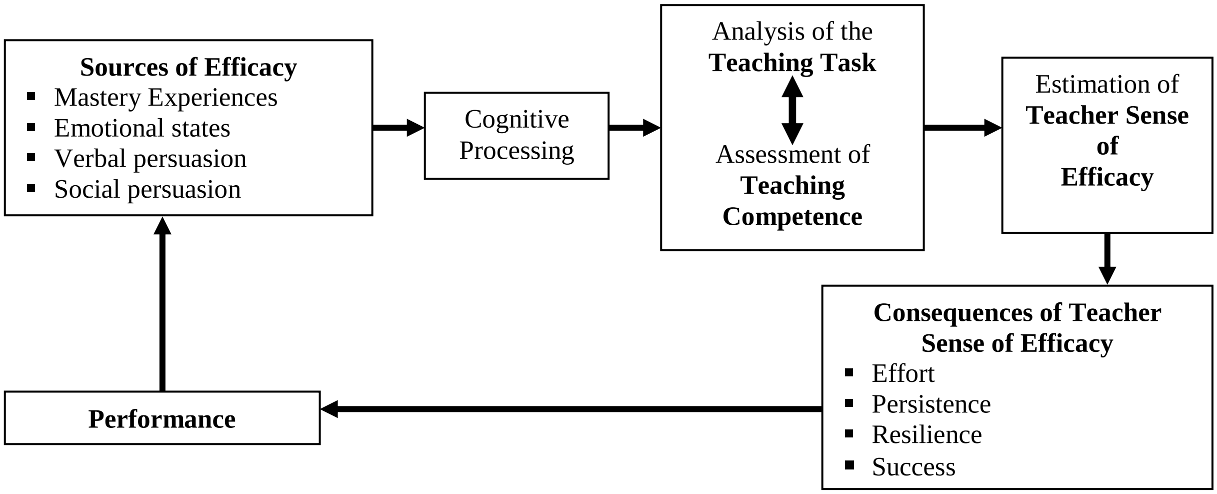

Figure 1. A Model of Teacher's Perceived Efficacy. (Woolfolk Hoy & Hoy 2009)

This research supports the National Research Agenda for Agricultural Education and Communication, Research Priority Four; Agricultural Education in Schools: *Prepare and provide an abundance of fully qualified and highly motivated agriscience educators at all levels.* Further investigation into pre-service teachers levels of teacher self-efficacy and the potential sources of teacher self-efficacy will benefit and inform teacher preparation and teacher professional development in agricultural education.

Purpose of the Study

The purpose of this research study was to describe the teacher self-efficacy of pre-service agriculture teachers. The following research objectives were used to guide the study.

Objectives of the Study

1. Describe selected personal characteristics of pre-service agriculture teachers.
2. Describe the perceived levels of teacher self-efficacy of pre-service agriculture teachers.
3. Determine the change in teacher self-efficacy over a semester.
4. Describe the differences in perceived levels of teacher self-efficacy of pre-service agriculture teachers based on demographic characteristics.
5. Describe the relationship among demographic characteristics of pre-service agriculture teachers and their perceived level of teacher self-efficacy.

Methods and Procedures

The population for this descriptive census study (N = 48) was pre-service Agricultural Education teachers at the University of Idaho in the fall of 2009. Frame and selection error were controlled by utilizing a current and unduplicated list. Non-response error was controlled by a follow up email and phone call to participants who declined to participate. Of the 48 students, 33 participated in the first assessment, 36 in the second, and 29 participated in both assessments.

Data were collected using an instrument developed by the researcher. The Instrument had four domains: Classroom Efficacy, FFA Efficacy, SAE Efficacy and Program Management Efficacy. Items specific to agricultural education were incorporated into the instrument from a variety of sources (Duncan & Ricketts, 2006; Duncan, Ricketts, Peake, & Uesseler, 2005; Garton & Chung, 1996; Joerger, 2002; Myers, Dyer, & Washburn, 2005; Roberts & Dyer, 2004). The instrument also contained items from the Instructional Strategies construct from the *Teachers Sense of Efficacy Scale* (Tschannen-Moran & Woolfolk Hoy, 2001). Scaling of the instrument was adapted from the *Teachers Sense of Efficacy Scale*, using a nine-point summated rating scale. The scale asked candidates to rate each item following the stem: “What is your level of capability to . . . <Item?>” on a scale from 1 = No Capability, 3 = Very Little Capability, 5 = Some Capability, 7 = Quite a Bit of Capability, and 9 = A Great Deal of Capability. A previous study established the reliability and validity of the instrument (Wolf, 2008). A post-hoc reliability assessment using Cronbach’s alpha internal consistency reliability coefficient was performed. The reliabilities of the three constructs ranged from 0.83 to .98.

The instrument was administered during the second week of the semester and during the last week of regularly scheduled classes. The freshman who responded to were all enrolled in the *Introduction to Agricultural and Extension Education* course, the sophomores were all enrolled in the *Principles and Philosophy of Professional-Technical Education* course, the juniors were all enrolled in the *Supervising FFA and SAE Programs* course, and the seniors were enrolled in the *Methods of Teaching Agriculture* course. The instrument for the second assessment had demographic items to determine individuals’ GPA, participation in FFA, and their perceptions of the teacher preparation program. Students’ perceptions of the teacher preparation program were assessed utilizing a six-point summated rating scale. Data were analyzed using the Statistical Package for the Social Sciences (SPSS v. 15).

Findings

The pre-service teachers in this study were all enrolled in the teacher preparation program at the University of Idaho. Thirty-one females and seventeen males participated in the study. Students reported their current grade point average at the end of the semester. Seniors reported the highest current GPA (M = 3.47), juniors (M = 3.24), sophomores (M = 2.12), and freshman (M = 3.10). Students were asked questions related to their past FFA experiences (see Table 1). Most participants (81.8%) were FFA members for four years or more.

Table 1
Pre-Service Teachers’ FFA Experience (n = 36)

	Yes %	No %
Were you an FFA member?	90	10
Did you compete in any State FFA Career Development Events?	87	13
Were you a Chapter Officer?	82	18
Did you receive you State FFA Degree?	58	42
Did you compete in any National FFA Career Development Events?	27	73
Did you receive your American FFA Degree?	19	81
Were you a State Officer?	14	86

Students were asked about their perceptions regarding the quality of their education on the second assessment. These data are presented in Table 2. The item with the highest level of agreement was "I am pleased with my education in agricultural education to date" (*M* = 5.19), and the item with the lowest level of agreement was "My education in College of Education courses has been of high quality" (*M* = 3.85).

Table 2
Pre-Service Teachers' Perceptions of Education (n = 35)

Item	M^a	*SD*	*Mo*
My education in AEE courses has been of high quality	5.09	1.04	6.00
My education in College of Education courses has been of high quality	3.85	1.54	5.00
My high School agricultural education program was of high quality	4.76	1.04	5.00
I am pleased with my experience in agricultural education to date	5.19	0.95	5.00

Note: [a] 1 = Strongly Disagree, 2 = Moderately Disagree, 3 = Mildly Disagree, 4 = Mildly Agree, 5 = Moderately Agree, 6 = Strongly Agree

Male pre-service teachers in this study reported a higher sense of teacher self-efficacy in all areas on the first assessment (see Table 3). However, at the time of the second assessment females reported a slightly higher level of teacher-self efficacy in the classroom domain, the SAE domain, the program management domain and overall teacher-self efficacy (see Table 4).

Table 3
Pre-Service Teachers' Self-Efficacy in Agricultural Education By Gender at the Beginning of the Fall Semester (n = 33)

	Male		Female	
Domain	M^a	*SD*	M^a	*SD*
Classroom	5.84	0.76	5.60	1.31
FFA	6.71	1.30	5.91	1.84
SAE	6.04	2.11	6.10	1.76
Program Management	5.88	1.51	5.50	1.77
Overall Teacher Self-Efficacy	6.14	1.15	5.80	1.41

Note: [a] 1 = No capability to 9 = A Great Deal of Capability

Table 4

Pre-Service Teachers' Self-Efficacy in Agricultural Education By Gender at the End of the Fall Semester (n = 36)

	Male		Female	
Domain	*M*[a]	*SD*	*M*[a]	*SD*
Classroom	6.12	1.07	6.13	1.56
FFA	6.72	1.83	6.37	2.38
SAE	6.29	2.10	6.69	2.00
Program Management	5.81	1.97	6.05	2.40
Overall Teacher Self-Efficacy	6.42	1.57	6.47	1.90

Note: [a] 1 = No capability to 9 = A Great Deal of Capability

The assessment was given to all students enrolled in the teacher preparation program. The largest group was the freshmen class, and the smallest group was the senior class. The data from each group is presented in Tables 5-6. Seniors reported the highest levels of teacher self-efficacy in most areas on both assessments. Juniors and sophomores reported similar levels of teacher self-efficacy on the first assessment.

Table 5

Pre-Service Teachers' Self-Efficacy in Agricultural Education by Grade Level at the Beginning of the Fall Semester (n = 33)

	Senior (n = 3)		Junior (n = 10)		Sophomore (n = 7)		Freshmen (n = 13)	
Domain	*M*[a]	*SD*	*M*[a]	*SD*	*M*[a]	*SD*	*M*[a]	*SD*
Classroom	5.75	0.78	5.26	1.62	5.66	0.67	6.03	0.92
FFA	6.89	0.51	5.87	2.00	5.99	2.12	6.42	1.43
SAE	5.72	1.15	6.58	1.31	6.06	2.40	5.79	2.12
Program Management	5.87	1.47	5.60	1.97	5.00	1.97	5.95	1.33
Overall Efficacy	6.08	0.67	5.79	1.54	5.80	1.43	6.07	1.28

[a] 1 = No capability to 9 = A Great Deal of Capability

Table 6

Pre-Service Teachers' Self-Efficacy in Agricultural Education by Grade Level at the End of the Fall Semester (n = 36)

	Senior (n = 3)		Junior (n = 11)		Sophomore (n = 11)		Freshmen (n = 11)	
Domain	*M*[a]	*SD*	*M*[a]	*SD*	*M*[a]	*SD*	*M*[a]	*SD*
Classroom	6.70	0.85	5.78	1.49	6.38	1.23	6.07	1.57
FFA	7.33	0.48	6.24	1.93	6.72	2.53	6.33	2.42
SAE	6.90	1.19	6.66	1.19	7.19	2.06	5.64	2.63
Program Management	6.93	1.47	5.95	1.66	6.42	2.40	5.25	2.67
Overall Efficacy	7.08	0.82	6.27	1.48	6.82	1.82	6.08	2.15

[a] 1 = No capability to 9 = A Great Deal of Capability

One objective of this study was to determine the changes in teacher self-efficacy over the course of a single semester (see Table 7). Seniors reported the greatest amount of change, (*M* = 1.00), while freshman experienced a negative change in all domains. The domain with the most changes for the seniors was the SAE domain, followed by the Program Management domain. Juniors and sophomores reported smaller changes in all areas. Sophomores reported the greatest change in the SAE domain and the least change in the FFA domain. Juniors reported the greatest change in the Classroom and Program Management Domains and the least in the SAE domain.

Table 7
Change in Pre-Service Teachers' Self-Efficacy in Agricultural by Grade Level (n = 29)

	Senior (n = 3)		Junior (n = 10)		Sophomore (n = 7)		Freshmen (n = 9)	
Domain	M^a	*SD*	M^a	*SD*	M^a	*SD*	M^a	*SD*
Classroom	0.95	0.23	0.40	0.58	0.41	1.68	-0.26	1.06
FFA	0.44	.038	0.14	0.82	0.28	1.96	-0.71	1.53
SAE	1.18	.093	0.08	0.90	0.87	2.90	-0.70	0.71
Program Management	1.06	.092	0.40	1.54	0.77	2.12	-1.29	1.63
Overall Efficacy	1.00	.040	0.37	0.67	0.66	2.04	-0.49	1.01

[a] 1 = No capability to 9 = A Great Deal of Capability

Tables 8-9 present pre-service teachers levels of teacher self-efficacy disaggregated by participation in FFA activities. Individuals who have participated in FFA activities reported higher levels of teacher self-efficacy in most domains on both assessments. Individuals who had been FFA members, chapter officers, State FFA Degree recipients and participated in CDE's at the State and National level reported higher teacher self-efficacy in all domains. This difference was most pronounced (in all domains) for individuals who had participated in State CDE events when compared to individuals who had not participated in State CDE events.

Table 8
Pre-Service Teachers' Self-Efficacy in Agricultural Education by Participation in FFA Activities During the First Week of School (n = 29)

		Classroom		FFA		SAE		Program Mgt		Overall	
		M[a]	*SD*	*M*[a]	*SD*	*M*[a]	*SD*	*M*[a]	*SD*	*M*[a]	*SD*
FFA Member	Yes	5.76	1.07	6.56	1.48	6.30	1.82	5.80	1.53	6.12	1.24
	No	5.01	1.85	4.11	2.41	5.00	2.45	4.40	2.88	4.70	1.84
Chapter Officer	Yes	5.71	1.15	6.63	1.52	6.54	1.62	5.78	1.62	6.18	1.28
	No	5.49	1.4.	4.97	2.13	4.82	2.36	5.03	2.21	5.13	1.53
State Degree Recipient	Yes	6.06	0.99	7.13	1.19	6.66	1.55	6.09	1.58	6.51	1.17
	No	5.23	1.29	5.26	1.86	5.55	2.17	5.07	1.86	5.30	1.36
State Officer	Yes	5.85	1.69	6.82	1.69	5.44	2.45	5.12	2.53	5.97	1.91
	No	5.62	1.20	6.32	1.67	6.36	1.77	5.78	1.64	6.01	1.32
American Degree Recipient	Yes	5.82	0.97	6.81	1.13	5.91	1.54	5.57	1.73	6.10	1.16
	No	5.60	1.34	5.91	2.0	6.10	2.13	5.53	1.86	5.80	1.53
State CDE Participant	Yes	5.85	1.04	6.78	1.30	6.43	1.84	6.00	1.41	6.27	1.16
	No	4.76	1.70	3.96	2.12	4.82	2.16	4.24	2.52	4.50	1.70
National CDE Participant	Yes	5.70	1.54	6.59	1.70	6.87	1.40	6.31	1.54	6.30	1.35
	No	5.65	1.14	6.17	1.87	5.90	2.09	5.48	1.79	5.84	1.44

[a] 1 = No capability to 9 = A Great Deal of Capability

Table 9
Pre-Service Teachers' Self-Efficacy in Agricultural Education by Participation in FFA Activities During the Last Week of School (n = 36)

		Classroom		FFA		SAE		Program Mgt		Overall	
		M[a]	*SD*	*M*[a]	*SD*	*M*[a]	*SD*	*M*[a]	*SD*	*M*[a]	*SD*
FFA Member	Yes	6.28	1.30	6.84	1.90	6.70	1.92	6.28	2.01	6.67	1.63
	No	4.93	1.49	3.82	2.62	5.09	2.53	3.45	2.42	4.64	1.93
Chapter Officer	Yes	6.29	1.34	7.04	1.67	6.93	1.71	6.45	1.88	6.80	1.52
	No	5.46	1.44	4.23	2.67	4.90	2.5	3.94	2.50	4.96	1.98
State Degree	Yes	6.77	0.86	7.56	0.90	7.33	1.07	6.84	1.26	7.28	.088
	No	5.33	1.50	5.18	2.56	5.52	2.47	4.86	2.67	5.40	2.02
State Officer	Yes	7.17	0.29	8.24	0.49	7.52	0.90	6.88	1.18	7.69	0.49
	No	5.98	1.43	6.38	2.06	6.42	2.13	5.91	2.30	6.32	1.79

Cont'd next page

Table 9 continued

		Classroom		FFA		SAE		Program Mgt		Overall	
		M[a]	*SD*	*M*[a]	*SD*	*M*[a]	*SD*	*M*[a]	*SD*	*M*[a]	*SD*
American Degree	Yes	6.74	0.66	7.46	0.90	7.18	0.97	6.69	1.18	7.18	0.75
	No	5.88	1.53	6.04	2.41	6.16	2.26	5.57	2.47	6.09	1.97
State CDE Participant	Yes	6.45	1.15	7.14	4.53	6.97	1.67	6.55	1.72	6.92	1.36
	No	4.67	1.41	6.59	2.33	4.83	2.70	3.4	2.10	4.40	1.76
National CDE Participant	Yes	6.34	1.28	7.23	1.22	7.19	1.05	6.9	1.43	6.99	1.13
	No	6.14	1.37	6.39	2.29	6.45	2.11	5.78	2.23	6.38	1.80

[a] 1 = No capability to 9 = A Great Deal of Capability

Demographic characteristics were collected to determine the relationship between pre service teachers' levels of teacher self-efficacy and demographic characteristics. These data are presented in Table 10. There was a moderate (Davis, 1971) correlation between pre service teachers perceptions' of their education in AEE courses and program management, and between the FFA domain and years spent as an FFA member. All other relationships demonstrated a low (Davis, 1971) or negligible association. Grade point average had a negative relationship with all domains of teacher self-efficacy.

Table 10
Relationship Among Demographic Characteristics of Pre-Service Teachers and Self-Efficacy in Agricultural Education During the Last Week of School (n = 34)

	Classroom	FFA	SAE	Program Mgt	Overall
Item	*r*	*r*	*r*	*r*	*r*
Current GPA	-.215	-.288	-.212	-.233	-.254
Years as an FFA member	.390	.418	.250	.323	.376
My education in AEE courses has been of high quality	.359	.327	.388	.438	.381
My education in College of Education courses has been of high quality	.113	.209	.052	.152	.137
My high School agricultural education program was of high quality	.092	.161	-.046	.039	.076
I am pleased with my experience in agricultural education to date	.352	.341	.309	.343	.352

Conclusions/ Implications/Recommendations

Pre-service teachers in this study were predominately female and had been involved in FFA programs in high school. Most of the participants had been FFA members, and over one-half had received their State FFA degree. Twenty percent of the participants had received their American FFA degree. Participants reported favorable perceptions of their experiences in the agricultural education program at the University of Idaho, with slightly less favorable perceptions of the College of Education courses.

The purpose of this study was to describe the teacher self-efficacy of pre-service agriculture teachers. The theory of teacher self-efficacy addresses an individual's belief in their abilities in a specific area (Bandura, 1997). This study reported pre-service teachers' perceived self-efficacy in four areas of agricultural education: classroom, FFA, SAE, and program management at two different points in time. Males reported higher levels of teacher self-efficacy on the first assessment, and females reported slightly higher levels on the second assessment. Females in this study evidenced a greater gain in their levels of teacher self-efficacy from the first assessment to the second assessment.

The seniors in this study were students preparing to enter their student teaching experience at the conclusion of the second assessment. The senior group reported the highest levels of teacher self-efficacy in most areas at the time of the first assessment. Caution should be used when interpreting these results, as there were a small number of participants in the senior group. The freshmen group reported levels of teacher self-efficacy similar to the seniors at the first assessment, juniors and sophomores reported the lowest levels of teacher self-efficacy. However, the freshman group did not report an increase in their teacher self-efficacy from the first assessment to the second assessment, while all other age groups reported increases. The seniors reported the greatest increase in teacher self-efficacy overall, and in each of the domains. As these individuals are preparing to enter their student teaching experience, and are enrolled in coursework related to that experience, this finding is encouraging.

One of the objectives of this study was to describe the differences in teacher self-efficacy based on demographic characteristics. Bandura (1994) states that self-efficacy is built through experiences, specifically mastery experiences. The experiences measured in this study were considered mastery experiences. It is interesting to note that individuals who had past FFA experiences reported higher levels of teacher self-efficacy in nearly all areas; especially on the second assessment. The differences between individuals who had experiences in FFA and those who did not were the most pronounced in the FFA domain, particularly at the time of the second assessment.

It was interesting to note that pre service teacher's grade point average was negatively related to teacher self-efficacy. Years as an FFA member was positively related to all four domains and to overall teacher self-efficacy. Additionally, positive perceptions of the teacher preparation program were also positively related to teacher self-efficacy. Teachers' perceptions of their high school agricultural education program had a negligible relationship with teacher self-efficacy.

The findings in this study raise several questions relative to teacher self-efficacy in pre-service teachers. The pre-service teachers in this study were mostly female. This finding, in contrast with the number of female teachers in Idaho (24%) is interesting. Are more females attracted to agricultural education in Idaho than males? Why? Females reported a greater increase in teacher self-efficacy than males from the first assessment to the second assessment. Why? Further research that examines gender differences with regards to teacher self-efficacy is recommended.

Freshmen in this study reported a decrease in their levels of teacher self-efficacy. Why? Perhaps this is due to the lack of knowledge of a total agricultural education program, and the decrease is due to their increasing awareness of the duties of an agricultural educator. Why did the seniors in this study experience the greatest change in teacher self-efficacy? What experiences occurred between the two assessments that may have influenced the increase in teacher self-efficacy? Are there additional experiences during the period during student teaching that should be further researched? Teacher educators should consider the implication of these findings as they prepare pre-service teachers for student teaching.

FFA membership and participation was related to teacher self-efficacy in this study. Why? This finding is troubling for teacher preparation programs, as not all students may be past FFA members. What remediation is required for non-FFA participants? Should teacher preparation programs require some FFA experience for admittance to the teacher preparation program? Do other youth organizations provide similar experiences? The experiences gained in FFA should be carefully examined to discern their possible impacts on teacher self-efficacy.

Further identification of experiences that build to teacher self-efficacy would be an asset to teacher educators as they plan programs of study. Further research, specifically a longitudinal study of teacher self-efficacy through teacher preparation and the beginning years of teaching would be appropriate to investigate these questions.

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Usability Testing and Evaluation of Texas Tech University Sorghum Research Initiative Web Site

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Abstract

Usability encompasses how easy something is to use. Usability testing is an integral part of user-centered design. The tests may be performed in a variety of ways including using a usability laboratory, a mixed-method data collection approach, and testing representative and non-representative users. Conducting usability tests on Web sites allows the site's developers to observe users' interaction with the site. If a Web site is not usable, users will go somewhere else to find the information they are looking for and the purpose of the site is lost when this happens. The efficiency, error, learnability, and satisfaction of a representative and non-representative user groups were measured during a usability test of the Texas Tech University SRI site that employed mixed-method data collection. The users were given a series of tasks to perform that related to the site's navigational scheme, layout, and content. The representative and non-representative groups efficiently navigated the site and were able to repeatedly utilize the site's functions. However, it was concluded that the representative user group committed less errors during their interaction with the site and that their overall satisfaction with the site was higher than the non-representative user group.

Introduction

The demand for readily-available information has increased rapidly along with the growth and advancement of technology. Today, the Internet is most often how people choose to retrieve and receive information and those people assume the Web has what they are looking for (Nielsen & Loranger, 2006). Usability testing is becoming more and more important as the use of the Web increases. "Usability is a quality attribute relating to how easy something is to use. More specifically, it refers to how quickly people can learn to use something, how efficient they are while using it, how memorable it is, how error-prone it is, and how much users like using it" (Nielsen & Loranger, 2006, p. xvi). If a site is not usable, users will simply stop using it and look somewhere else for the information they need. The initial purpose of the site is lost when this happens (Nielsen & Loranger, 2006).

As with any agricultural industry, sorghum interest encompasses a diverse population. Researchers, scientists, producers, growers, and those simply interested in sorghum research and information need credible, accurate resources to further their studies. The Texas Tech University Sorghum Research Initiative ([University]SRI) Web site was established in 2006 in response to a need for adequate and up-to-date research information for the sorghum industry.

Multiple usability researchers including Nielsen (2000), Krug (2006), and Still (personal communication, January 27, 2009) recommend testing a site numerous times from the moment it is created. Ayers (2008) conducted a general usability study on the [University]SRI site. Her findings encompassed multiple usability variables such as credibility, efficiency, effectiveness, and utility. The findings indicated overall satisfaction relating to the usability of the [University]SRI site. She stated a different kind of usability test should be completed in order to gain further perspective on the site.

Quesenbery (n.d.) described five characteristics of interface usability: effective, efficient, engaging, error tolerant, and easy to learn. Barnum, Henderson, Hood, and Jordan (2004) employed these five characteristics in their usability study titled “Index Versus Full-Text Search: A Usability Study of User Preference and Performance.” The steps of their testing included heuristic evaluation, participant profile and recruitment, test scenarios, testing methodology, and information gathering. In order to retrieve as much information as possible from the study, the researchers gathered quantitative and qualitative data. This method allowed them to administer a pre-tasks, post-tasks, and satisfaction questionnaire and observe the users’ comments and facial expressions. A similar test plan was carried out for this study.

Theoretical Framework

The theoretical framework for this study focused on the uses and gratifications theory. The theory ultimately declares that a subject will actively seek out the mass medium which best satisfies their needs (Baldwin, Perry & Moffitt, 2004). “[The] uses and gratifications theory assumes that audiences are not targets for the media to hit. Instead, audiences members actively select media messages, and they do so with particular goals in mind” (Baldwin et al., 2004, p. 198). The usability of a site is important because of active users. Most sites are developed to serve as a reliable, credible, and long-term resource for those seeking information. The applied framework for this study focused on the concept of usability as defined by Nielsen (2006) in which he divided the definition of usability into easy to learn, efficient to use, easy to remember, few errors, and subjectively pleasing. Still (personal communication, January 20**,** 2009) interpreted this concept as MEELS, which stands for memorability, efficiency, error, learnability, and satisfaction. MEELS encompasses the idea that users should also be able to easily seek out the information available on the Web site on their own, time and time again, with little or no error. Many studies use this framework as a solid foundation for usability testing (Nielsen, 1993; Barnum, 2004).

Purpose and Objectives

The *National Research Agenda for Agricultural Education and Communication* (Osborne, n.d.) includes the need to conduct research that improves the effectiveness of communication content and methods. As stated previously, usability is an important aspect of any information on the Web. The purpose of this study was to test and evaluate the usability of the [University]SRI Web site. The following objectives were investigated throughout the course of this study:

1. Determine the efficiency of the TTUSRI Web site as perceived by representative users and non-representative users.
2. Determine how error tolerant the TTUSRI Web site is as perceived by representative users and non-representative users.
3. Determine the learnability of the TTUSRI Web site as perceived by representative users and non-representative users.

4. Determine the satisfaction rate of the TTUSRI Web site as perceived by representative users and non-representative users.

Methodology

One method used to conduct usability testing is in a laboratory type setting. The Usability Research Laboratory at Texas Tech University is an example of a usability testing lab. The lab is divided into two rooms—an observing room and a room in which the test is conducted. The two rooms are divided by a one-way mirror. Cameras and microphones are set up to record the users' actions while the observer watches from behind the mirror. In some instances, usability software such as Morae may be utilized. This software allows the observer to note of observations while watching video of the user in real time. Morae also allows pre-tasks, post-tasks, and System Usability Scale (SUS) (Brooke, 1996) surveys to be sent to the user via the computer.

In addition to the observer, a facilitator is needed to assist with testing procedures. He or she is responsible for all communication to the users including the introduction and explanation of scenario, user tasks and task completion, pre-tasks and post-tasks questionnaires, keeping the user on topic, and giving answers to the user(s) should the question fit the pre-defined criteria of what can be answered. Think-aloud protocol is an important part of usability testing (Lazar, 2006). With think-aloud protocol, the users are asked to talk out loud and reveal their thoughts while they navigate through the Web site and complete tasks. User tasks are formulated prior to testing. The tasks should encompass various areas of the Web site and encourage the user to make use of the site's navigational scheme and layout and should be arranged from simple to complex (Barnum, 2002). For the purpose of this study, both user groups were assigned seven tasks that ranged in difficulty.

A mixed-methods, or qualitative and quantitative, approach may be applied in usability testing (Nielsen, 2006). Data collected for this particular study included direct quotes from the users, basic demographics, computer and Internet usage, open-ended responses to the post-tasks questions, mouse clicks, error rates, and SUS survey answers and ratings. One or more of these data sources was used in analyzing the findings for each of the four objectives. The data collection process was conducted at the time of the test using Morae Recorder and Observer software. In order to prevent researcher-bias, further, in-depth analysis took place after all the testing was completed when a pair of researchers evaluated each video using Morae Manager. The two researchers went through the scripts identifying the ease and difficulty of the tasks. The tasks were coded based on the following scale by Dumas and Redish (1999): 0 = subtle or no problem; 1 = has minor effect on usability; 2 = creates significant delay or frustration; 3 = prevents completion of task. The coding scale was decided upon prior to the testing and the researchers discussed how they felt each task should be rated. The researchers discussed each task score until a 100% consensus was reached. When differences arose, the researchers discussed until consensus was reached.

Several drawbacks of usability testing are time, budget, and access. These issues go hand-in-hand when choosing which user group to test. Each user group chosen for testing was justified because they represent real users of the Web site. Contrarily, one non-representative group was chosen to further test the usability of the Web site. The researchers were interested in comparing representative and non-representative users and how they carried out the tasks given to them. It was important to keep in mind the accessibility of the user groups. The usability testing took place on campus. Therefore, emphasis was placed on the chosen users' accessibility along with their ability to provide accurate and representative test results.

Of the pre-determined user groups, three groups were selected for participation in the study. Senior students enrolled in the Spring 2009 semester in the Department of Agricultural Education and Communications were recruited for the pilot test. For the actual testing, graduate students enrolled in the Fall 2009 semester in the Department of Plant and Soil Sciences and undergraduate students enrolled in the Fall 2009 semester in the College of Mass Communications were recruited. The plant and soil science students were identified as representative users, while the mass communications students were recognized as non-representative users of the Web site. The number of users tested depends on the complexity of the system being tested. Head (1999) pointed out that it does not take a large number of users to point out the navigational problems of a site. Complex Web sites consist of more complicated functions such as purchasing and in-depth searches. "The range of tests one can conduct is considerable, from true classical experiments with large sample sizes and complex test designs to very informal qualitative studies with only a single participant" (Rubin & Chisnell, 2008, p. 21). "In most cases, I tend to think the ideal number of users for each round of testing is three, at most four" (Krug, 2006, p. 138). Nielsen (2006) suggested five users for each round of testing. Lazar (2006) acknowledged that budget, timeline, and access may limit testing. He stated testing with only five users is better than no testing at all.

Findings

Table 1 showcases age, gender, and classification by user group. The majority, 60.0% (*n* = 3), of PSS users were 20-24 years of age, one user was 25-29 years of age, and one user was 40-44 years of age. There was no mode for age within the PSS user group. All five, 100.0%, of the PSS users were male and classified as graduate students. All, 100.0%, of MCOM users were 20-24 years of age. The recorded mode for MCOM users was 22 years of age. The majority, 80.0% (*n* = 4), were female and one user was male. Also, 100.0% were classified as senior-level students.

Table 1
Demographic Characteristics of [University]SRI User Groups (N = 10)

	PSS (*n* = 5)			MCOM (*n* = 5)		
Characteristic	*f*	*f* %	Mode	*f*	*f* %	Mode
Age			20-24			20-24
20-24	3	60.0		5	100.0	
25-29	1	20.0		0	0.0	
30-34	0	0.0		0	0.0	
35-39	0	0.0		0	0.0	
40-44	1	20.0		0	0.0	
Gender			Male			Female
Female	0	0.0		4	80.0	
Male	5	100.0		1	20.0	

Classification			Graduate			Senior
Graduate	5	100.0		0	0.0	
Senior	0	0.0		5	100.0	
Junior	0	0.0		0	0.0	
Sophomore	0	0.0		0	0.0	
Freshman	0	0.0		0	0.0	

Note. Gender coding: Female=1 Male=2

Table 2 reports the users' description of their computer skills and the hours per day they spend on the Internet. Prior to the beginning of the study it was assumed that all users would have basic computer and Internet skills. Table 2 validates that assumption. In regard to the description of their computer skills 60.0% (n = 3) of PSS users described themselves as skilled, one user described himself as slightly skilled, and one user, described himself as very skilled. Two PSS users, 40.0%, spent 1-2 hours per day on the Internet while one user spent 1 hour per day, one user spent 4-5 hours per day, and one user spent five or more hours per day on the Internet.

Table 2
Perceived Computer Skills and Hours Per Day Spent on Internet of [University]SRI User Groups (N = 10)

	PSS (n = 5)			MCOM (n = 5)		
Statement	*f*	*f* %	Mode	*f*	*f* %	Mode
Describe your computer skills			Skilled			Skilled
Not very skilled	0	0.0		0	0.0	
Slightly skilled	1	20.0		1	20.0	
Skilled	3	60.0		4	80.0	
Very skilled	1	20.0		0	0.0	
Time per day spent on Internet			1-2 hours			1-2 hours
1 hour	1	20.0		1	20.0	
1-2 hours	2	40.0		3	60.0	
2-3 hours	0	0.0		0	0.0	
3-4 hours	0	0.0		0	0.0	
4-5 hours	1	20.0		1	20.0	
5 or more hours	1	20.0		0	0.0	

The majority, 80.0% (n = 4), of MCOM users described themselves as skilled computer users. Only one MCOM user described herself as slightly skilled. The majority of the MCOM users, 60.0% (n = 3), spent 1-2 hours per day on the Internet. One user spent one hour per day and one user spent 4-5 hours per day on the Internet. The mode for perceived computer skills and hours per day spent on the Internet was the same for both user groups—skilled and 1-2 hours.

Objective one examined the efficiency of the [University]SRI site as perceived by representative and non-representative users. In the context of usability, efficiency relates to the intuitiveness of the site. The site should allow users to quickly find the information they are seeking and should enable them to do so repeatedly.

In order to determine the efficiency of the [University]SRI site, the average time both groups spent on each task was recorded and the number of mouse clicks the users used to accomplish the tasks were compared to the number of mouse clicks required for task completion as established a priori. PSS users had a lower average of mouse clicks per task than MCOM users. Throughout the study, the researcher observed that MCOM users were more likely to quickly click and scan through pages of the site without taking much time to read the information located on the pages.

> MCOM User 1: "I'll click on some of these."
> "I guess I can click on these links to see if that's what I need to find."
> MCOM User 3: "I'm just going to click one and see what it gets me."
> "I'm just looking at these links and seeing if anything applies because I'm pretty sure I've been to all of them."

The average number of mouse clicks from both user groups does differ greatly from the clicks required to complete each task. Overall, this fact was not considered detrimental to efficiency because the users had no previous experience navigating through the site.

The time users spent on each task was also factored in to determine the efficiency of the site. Figure 1shows the time MCOM and PSS users spent on each task.

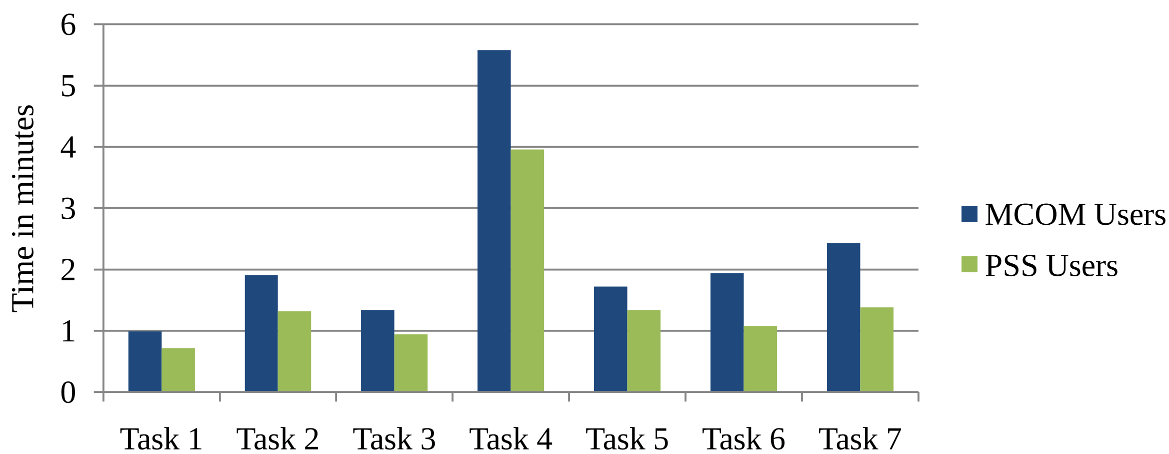

Figure 1. MCOM and PSS users average time on task

As illustrated in Figure 1, on average MCOM users spent more time on each task than the PSS users.

As mentioned, the PSS users were chosen as representative users due to their familiarity with research and agriculture and the MCOM users were chosen due to their unfamiliarity in these areas. The difference in knowledge was noticeable various times during the usability testing. The following quotes help confirm these differences.

> MCOM User 5: "I have no idea how to even try to find that stuff."
> "If I don't even know where to go, do I have to find it?"
> PSS User 5: "It looks like it's going to give you a scholarly article but it doesn't."
> "I think it's this search over here, but what's coming up is not technically a scholarly article."

Knowledge of research, sorghum, and agricultural-related terminology seemed to help the PSS users complete the assigned tasks. For example, they tended to be more analytical of what exactly a scholarly article was; whereas MCOM users had trouble identifying scholarly articles. Additionally, the average time on task for Tasks 4, 6, and 7 required the users to utilize the Research and Links tabs. These tasks had the greatest difference in average time between the PSS and MCOM users.

Objective two determined the relation of errors made during the usability testing by representative and non-representative users. In the context of usability, errors are defined as any action that does not accomplish the desired goal (Nielsen, 1993). Errors were initially marked when a user began a task by clicking on the wrong page or chose a path other than the optimal one to complete a task. However, those errors were regarded as minor as long as the user completed the task successfully. Referring back to the definition of error in relation to usability, the researcher reported the number of errors that led to incompletion of tasks. These errors may also be referred to as catastrophic. The tasks were scored on a scale of zero to three. A score of zero indicated the task was completed with subtle or no error. A score of one indicated a minor effect on usability occurred. Significant delay or frustration with a task received a score of two. Most severely, a score of three identified a failed or incomplete task. For example, Task 1 was scored as zero nine times and as one a single time.

The tasks that were more complex received a higher number of incomplete scores. Task 4, the most complex task, received the highest number of incomplete scores. This task asked the users to locate three research resources on sorghum improvement. The focus was to lead the users to the three areas of the research tab—ongoing research, archived research, and Texas Tech University research. Almost half, 40% (n = 4), of the users did not complete this task. Three of the four incompletions came from MCOM users who seemed frustrated and unsure of what Task 4 was asking them. They had the following responses in relation to what they would change about the site's research database.

> MCOM User 2: "Have the database grouped in to categories based on date, location, context, etc."

> MCOM User 3: "I would definitely make the article link more noticeable. I would have given up on finding it if I were at home."

Contrary to the MCOM users, PSS users were mainly in agreement they would not change anything about the research database. PSS User 2 felt the database should identify the scope of the research on "local, state, national, and international" levels. PSS User 4 did not complete Task 4. His response to what he would change about the database echoed the fact that he never visited the database during the test. He said, "[I would change] nothing. It seems to be easy to find and looks like it would be easy to use." Instead, he was trying to complete the task using the "Research and Information" option under the "Links" tab. Research and information links allow the user to access other universities, companies, and Web sites related to sorghum research. He seemed to realize this error later in the post-question survey when asked about his overall experience with the site. He stated, "The links page made me think it had links to research when I should have been on the other link."

On several occasions throughout the test, users from both groups could not remain on their navigational path due to links that were not functioning correctly or pages that could not be found. Most often the "page cannot be found" error arose when users incorrectly used the search box at the top of the page, which will be discussed later. The broken link error on the site occurred when users tried to click directly on the "Research and Information Links" tab that was discussed earlier in this objective. PSS users were the only ones to comment on their experience with the broken links.

> PSS User 2: "Make sure the links are working."
> PSS User 3: "There were a couple of links that I found that were not found or not available. This was the only problem that I could find with the site navigation."

As mentioned earlier, users would occasionally encounter a "page not found error." This error was due to improper use of the search function located on the site. The site features a database search box at the upper left-hand side of the page above the "Page Resources." The search box allows users to enter keywords relating to sorghum from the home page instead of trying to find the database search nestled at the bottom of the archived research page. The text above the box reads "Sorghum Database Search." The researcher noticed a trend regarding how users operated the search box throughout the testing. Many Web sites, including the main Texas Tech University site, offer a search function that allows users to type in any inquiry, specific or broad, and the entire site is searched for this information. The same is true with popular search engines. The search box only searches text located within the research database. Potential keywords users could search for are genetics, food, improvement, breeding, and sorghum.

On numerous occasions, users tried to repeatedly use the database search box as they would use a search function that explores the entire Web site. For example, when asked to find a keyword search area on the site for scholarly articles, several users typed in "scholarly articles" in the search box and received a "page not found error." MCOM users employed the database search box more often than PSS users. When asked what they would change about the site's navigation, the majority of MCOM users suggested making changes related to the search box and its functions.

> MCOM User 2: "I would change the link for people to find a place to search for scholarly articles. I would make it easier to locate broad categories such as: affiliated organizations, submitting a suggestion, and how to determine which types of research are being done (nationally and locally)."

Errors regarding the usability of the TTUSRI occurred in several different ways. The researcher felt it was important to distinguish between the errors of the Web site itself and the errors of the user navigating through the site. Both of these errors can have an effect on the overall usability of the site. Although errors did exist, the users were still able to complete the assigned tasks in a timely manner.

Objective three assessed the learnability of the TTUSRI site as perceived by the same users. Users should be able to quickly understand the navigational layout and perform similar actions throughout the duration of the test. Simply put, learnability focuses on how easy the system is to learn.

In general, the navigational layout of most Web sites consists of one or more of the following: a left-hand toolbar, a right-hand toolbar, or a toolbar at the top of the page (Nielsen, 2000). Due to their Internet use and computer experience, the users for this study had an existing familiarity with the navigational layout of Web sites. Prior knowledge was evident when users said, "I'm assuming," "That's where I think it should be," and "Usually," in relation to where certain information was located on the site. The main navigation for the TTUSRI site is located down the left-hand side of the interface and is referred to as "Page Resources." The navigational toolbar at the top of the site is not related to the TTUSRI site, but offers choices associated with the university and the main campus Web site. Direct quotes from the users during testing and responses to post-tasks questions indicate familiarity with navigational layouts and the navigational layout of the TTUSRI. These quotes also demonstrate the users' learnability of the site:

> MCOM User 3: "First I'm going to look for links. I usually look on the top and then I go to the left side."
> "Usually it's toward the bottom of the left-hand side. There's usually a bunch of contact info at the bottom."
> PSS User 2: "That's generally found under links on most Web pages."
> PSS User 3: "I'll go back over to the page resources."

Throughout the tests, the users adopted the use of the "Page Resources" as the primary location for the beginning of each task. The only time this was not the case was in relation to the second task in which users were asked to find specific contact information. For this task, the users employed the top toolbar. Although this was not the optimal path, nine of the 10 users still completed the task.

In regard to learnability, overall, both the representative and non-representative users exhibited the skills necessary to navigate their way through the usability test. They were able to use the navigation scheme and layout available to continuously guide themselves through the TTUSRI site.

Objective four determined the satisfaction of the representative and non-representative users during their interaction with the TTUSRI site. Satisfaction refers to how pleasant the system is to use. Simply put, do users like using the system? User satisfaction with the TTUSRI site was measured by using the results from the SUS survey taken by each user at the end of their test. This 10 question survey is used to measure the users' opinions of the site. The results from the SUS survey are shown in Figure 2.

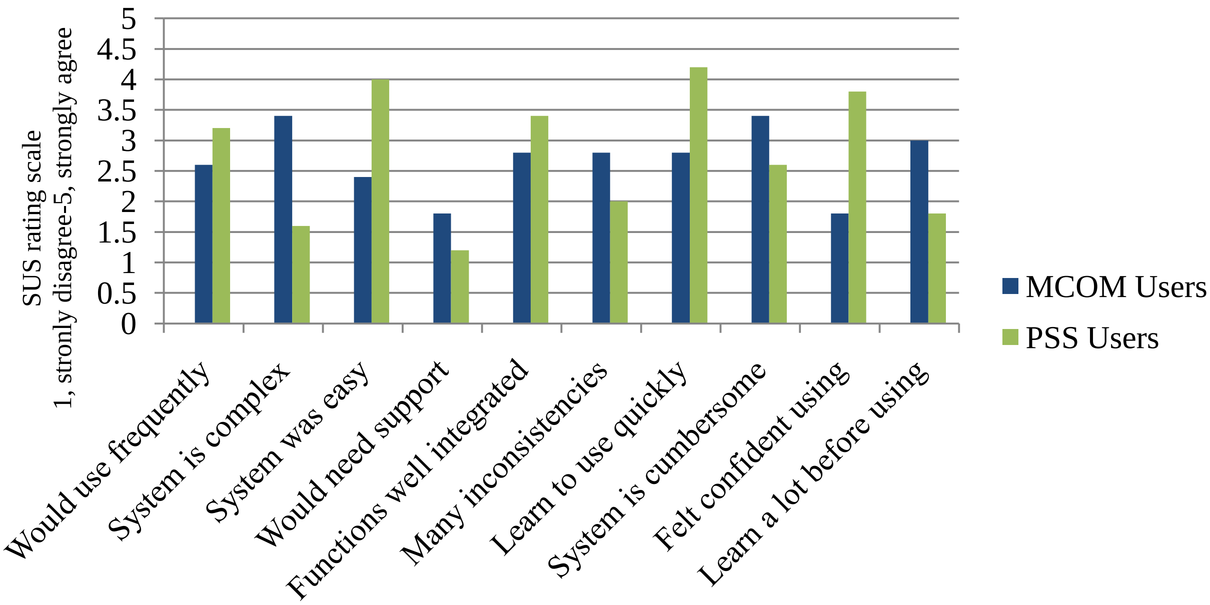

Figure 2. Average SUS survey results by question.

Noticeable differences existed between the MCOM and PSS responses. The biggest differences in agreement related to questions regarding users' feelings about their use of the site. Case in point, MCOM users felt the system was more complex and PSS users felt that they system was easier to use. Also, PSS users disagreed with the question asking if they felt they would have to learn a lot before using the system. MCOM users responses were neutral in regard to the same question. According to the survey, one of the biggest differences in MCOM and PSS users was their confidence level in using the site. PSS users indicated they felt confident using the system. An important area of the survey to note is the first question: I would use this system frequently. Only a small difference existed between MCOM and PSS users' response to this question. The average SUS score from each user group was also collected. MCOM users gave the site and average satisfaction rating of 45%, while PSS users gave the site a 73.5% satisfaction rating.

MCOM and PSS users gave the following responses when asked about their overall experience with the [University]SRI site.

MCOM User 4: "Well I have never been on this particular website so it was a little bit confusing at first glance but overall I feel that the page resources which are located on the left hand side of the screen helped me during my navigation."

PSS User 5: "The Web site was easy to navigate. The panel on the left side of the page made everything easy to find. Contact info was the hardest to find because it was not under the link at the top of the page that said 'Contact.'"

Overall, the findings indicated the representative user group, plant and soil science graduate students, had a more general understanding of the TTUSRI site than non-representative group of mass communications undergraduates. The PSS users' knowledge of research and agriculture likely helped them relate to the site more than MCOM users. This conclusion is supported by the following observations. Both groups quickly learned and continuously used the "Page Resources" navigation to help guide them through the site. However, the average time PSS users spent on each task was less than MCOM users. In regard to errors, both groups did have frustrations with several tasks or failed to complete a task. Overall, MCOM users received more incomplete task scores than PSS users. The SUS survey results indicated a higher, overall satisfaction rate among PSS users than MCOM users.

Conclusions/Implications/Recommendations

These findings confirm that the [University]SRI site is beneficial to representative users—those with a knowledge of research and agriculture. However, future adjustments may be made to the site in order to further increase satisfaction levels among representative users. After the conclusion of this study, several recommendations are provided for future testing of the [University]SRI site. First and foremost, before future research is conducted, adjustments should be made to the site based on the findings and recommendations from this study.

The mixed-methods approach employed for this study provided adequate and accurate data. The qualitative information gathered from direct quotes and post-tasks questions was beneficial in showcasing the users' feelings, positive and negative, during testing. Quantitative information retrieved from the recruitment form, pre-tasks, and SUS surveys gathered important information such as the users' demographics, computer skills, familiarity and use of databases, use of agricultural and sorghum-related Web sites, and feelings related to the overall usability of the [University]SRI site. The data gathered from both methods of collection was instrumental in presenting the findings of the usability study. Applying both methods to future studies will help provide solid and informative results.

It is important to determine user groups prior to testing. For the purpose of this study, a representative user group and a non-representative user group were tested. The accessibility of the population was considered an important factor in this study due to the location of the testing. Future usability studies should recruit sorghum researchers and producers. It is noted these participants may be hard to recruit and access due to their varying locations and schedules. Testing these users may require future researchers to employ a different style of observing and testing (such as field testing or site visits) than the methods employed for this study. Future researchers should follow usability recommendations for field testing or site visits.

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A Case Study and Framing Analysis of the 2008 *Salmonella* Outbreak

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Abstract

In April 2008, the United States Food and Drug Administration began investigating a potential Salmonella outbreak in Texas and New Mexico. Initially, tomatoes were the suspected carrier of the pathogen; however, after three months of investigation, the FDA determined jalapenos grown in Mexico were the culprit. Tomato growers across the United States reported losses of $250 million. The purpose of this study was to examine television news coverage of the Salmonella outbreak through a case study using framing theory in order to gain an understanding of how reporters' ideologies, attitudes, and corporate pressures, as well as interview sources, influenced the frames that were reported on national television news networks. A case study using interviews with reporters was used to investigate the research questions. The reporters revealed they supported the farmers, they wanted change within the FDA, they had confidence in the U.S. food supply, and corporate policy did not influence news coverage. Reporters will use the agency that issued the recall for an interview source; however, they also use consumer watchdog groups, industry organizations, and academics. This study concluded that in some instances, television news frames are influenced by the reporters' attitudes and ideologies, and in other instances, they are not.

Introduction and Theoretical Framework

The most prominent food recall of 2008 began in April when the Food and Drug Administration (FDA) began investigating a potential *Salmonella* outbreak in Texas and New Mexico (FDA, 2008, June 3). Tomatoes were originally suspected, and by the end of August 2008, approximately 1,440 Americans in 43 states and Washington, DC reported an illness related to the *Salmonella* outbreak (Alonso-Zaldivar, 2008). The FDA eventually determined jalapeno and Serrano peppers grown in Mexico caused the outbreak. By the end of the summer, the United States tomato industry reported losses of more than $250 million (Alonso-Zaldivar, 2008).

According to Riddle (2007), the media has kept food safety stories in the spotlight by reporting every major or minor foodborne illness outbreak or food recall. Intense coverage of food recalls can frighten consumers away from the affected product; reduce confidence in food regulatory agencies, such as the USDA or the FDA; and decrease trust in agricultural producers. Over time, these food recalls can reduce the public's trust in the nation's food supply and can potentially have a negative effect on United States farmers and ranchers. Outbreaks of foodborne illness are usually heavily covered by media and result in decreased demand for the affected food product (Whaley & Tucker, 2004).

Purpose and Research Questions

The purpose of this study was to examine television news coverage of the 2008 *Salmonella* outbreak through the scope framing theory (Scheufele, 1999). This research was to gain understanding of how journalists' personal ideologies, attitudes, and organizational pressures build frames that are presented in television news. By understanding what television reporters think of food safety stories and where they obtain their information, agricultural communicators will be able to more effectively and proactively craft messages and promote accurate food safety information. By conducting a case study, this research was guided by the following questions:

1. What were the inputs (organizational pressures, individual attitudes, and ideologies) that influenced the way television media report food safety information based upon the 2008 *Salmonella* outbreak in tomatoes and jalapenos?
2. When covering the 2008 *Salmonella* outbreak, were there interview sources that reporters were more inclined to use, and if so, what were their opinions about those sources?

Television news, rather than newspapers, "had an independent effect on the public's concerns about food safety. Compared with newspaper, television news may be relatively easier for audiences to follow because it requires less mental effort in information processing" (Fleming, Thorson, and Zhang, 2006, p. 803). Therefore, television reporter interviews were the units of analysis for this study.

Theoretical Framework

A media frame is "a central organizing idea or story line that provides meaning to an unfolding strip of events…the frame suggests what the controversy is about, the essence of the issue" (Gamson & Modigliani, 1987, p. 143). Miller (2002) explained framing as "a process through which the media emphasize some aspects of reality and downplay other aspects. Framing can be accomplished through the consideration of particular subtopics, size and placement of a news item, narrative form and tone of the presentation, and particular details included in the media coverage" (p. 262). Simply stated, frames are how journalists tell a story, and frames can tell the public how to think about an issue. Factors such as political orientation of the medium can also influence the way the media frame a story (Scheufele, 1999). Reporters do not intentionally frame stories; instead, constraints from a news organization's management, professional judgement, and opinions about the audience and the situation can lead a writer to give a story a certain frame (Neuman, Just, & Crigler, 1992). Interest groups, social institutions, and activists are experts at getting journalists to present their frame (Baran & Davis, 2009). Many of these groups can involve journalists in constructing news drama, which in turn, promotes a frame.

The model used for this research was proposed by Scheufele (1999) (See Figure 1) and focused on the top half, analyzing the frame building process during the *Salmonella* outbreak. Although Scheufele's (1999) model illustrates how journalists' personal opinions and attitudes can be processed into the information reported on television, Newcomb & Alley (1983) indicated that reporters are people: they have responsibilities and attitudes, and they will have thoughts, feelings, and interests toward certain stories. However, Weaver and Wilhoit (1991) found that reporters may not have time to allow personal opinions to influence their reporting.

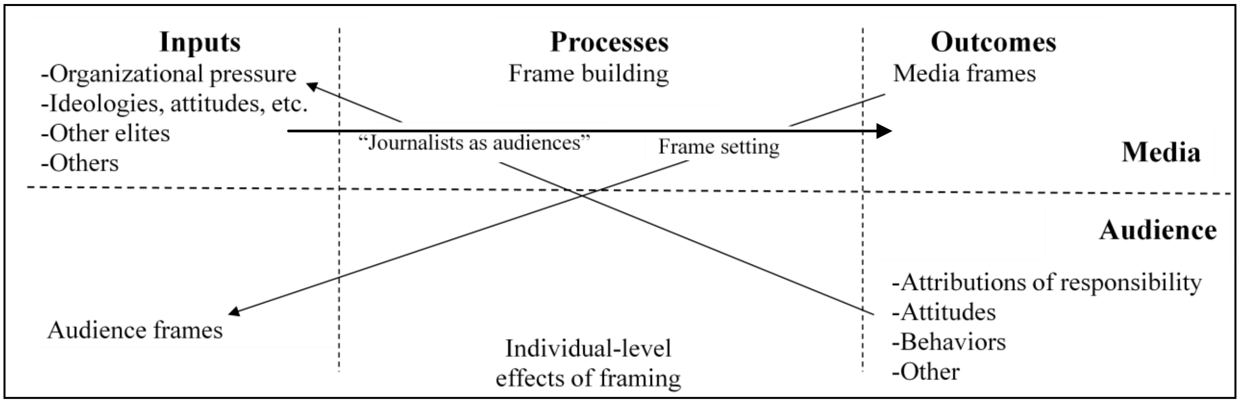

Figure 1. Model of framing effects (Scheufele, 1999).

Television News Framing
In agricultural communications research, studying how the television news media frame issues is not common. However, in studying television news coverage of the 2008 *Salmonella* outbreak, Irlbeck and Akers (2009) found that national television news networks presented anti-government, pro-agricultural producer, and anti-Mexican produce imports frames. The research found that most of the stories were informational and were warning the public about a potential threat. Most of the news coverage was based on the facts that were available at the time; however, CNN provided personal opinions and speculation. The networks most commonly used interview sources from the FDA followed by tomato growers, consumers, politicians, the Center for Science in the Public Interest, and the Center for Food Safety (Irlbeck & Akers, 2009).

Food Safety and Agriculture in the Media

A Rutgers University study found the public was highly aware of the 2008 *Salmonella* outbreak, but were often confused about the specific action they were supposed to take to prevent the illness (Cuite, Schefske, Randolf, Hooker, Nucci, & Hallman, 2009). The study found that consumers paid attention to the message the first time they heard it, but attention drifted from the subject afterward. One of the researchers said "as the lists of foods being recalled are updated day by day, I think it's unlikely that consumers would go back and keep checking them. A very small percentage actually determine if a product they've purchased is part of the recall" (Filipic, 2009).

When consumers hear about a food recall, they may think the agricultural producer is at fault as evidenced on an ABC News message board following an *E. coli* beef recall. People posted comments blaming the cattle producers, feedlots, meat processors, and the government for *E. coli* contamination (ABC News, 2007, June 11). Negative food safety issues were highlighted twice as often as positive stories, and environmental or health activists were quoted five times as often as food scientists (Anderson, 2000). Anderson (2000) concluded that few reporters have science training, and few scientists have training in communicating with the media in simple and clear language, thus creating a problem when trying to tell food safety stories.

Media can be an important tool to convey food safety messages (Eyck, 2000). However the public only hears about food safety when there is a crisis or a threat to food (Eyck, 2000). The Eyck (2000) study implied that instead of only covering food safety in times of crisis, media could be an educational outlet to inform the public on foodborne illness prevention, and the solution was for food safety experts to create relationships with journalists.

Limitations

This study was limited to news reporters from ABC, CBS, and NBC. The three news organizations were the only available national, network, non-cable news transcripts at the university library via Lexis-Nexis. In addition, the three networks are available to all television households—not everyone has cable or satellite television.

The National Research Agenda

This study fits into the National Research Agenda, Agricultural Communications Research Priority Area 1: Enhance Decision Making Within the Agricultural Sectors of Society (American Association for Agricultural Education, 2007). This priority area seeks solutions to improve tools for communication with local and national audiences so that coordinated agricultural communications efforts can be attained. The research priority area also seeks to “determine information needs and preferences of identified local, national, and international audiences” (p. 9).

Methodology

The methodology for this constructivist study was a qualitative case study. A case is a single entity, or bounded system, selected because it is intrinsically interesting (Smith, 1978). The bounded system for this study was the reporters and their comments about coverage of and sources used for the 2008 *Salmonella* outbreak. Through interviews, television reporters’ ideologies, attitudes, corporate policy, and opinions of potential sources and other elites were examined. In addition, the participants provided insight into any preferred interview sources.

Interviews

Creswell’s (2007) model for data collection activities was used for this study. The researcher obtained the names of the 20 reporters who covered the 2008 *Salmonella* outbreak from news transcripts that were available through the Lexis-Nexis search engine in the university library. The researcher was once a television reporter and e-mailed former co-workers to obtain contact information for the network reporters who covered the *Salmonella* outbreak. According to Hoffman (1980), utilizing social ties substantially yields more informative and useful data. The news business is relatively small, and within three days, e-mail addresses were obtained for almost every reporter who covered the outbreak. The majority of the network reporters who covered the story were located in Washington, DC. The reporters were e-mailed asking them to participate. However, after two weeks of initial and follow-up e-mails, only five reporters agreed to participate. Although Merriam (1995) argued that small sample sizes, even as small as one participant, are acceptable in qualitative research, five interviews were not enough to justify a trip to Washington, DC. For situations with a smaller- than- desired sample size, Creswell (2007) recommended discriminant sampling—sampling that can be used when researchers need additional information but the optimal participants are not available. Therefore, individuals who are *similar* to the target population can be utilized as long as the theory being studied holds true for the additional participants. Using discriminant sampling, seven more reporters in large cities near Washington, DC and in Texas were confirmed. The similar reporters had either covered the 2008 *Salmonella* outbreak or had previously covered food safety stories. The discriminant sampling brought the sample size to 12. Stake (2006) stated that an adequate sample for a case study consists of four to 15 participants.

The interviews were conducted in the participants' place of business (Berg, 2009) with the exception of one reporter who was unavailable, so she was interviewed via telephone. The subjects signed a university-approved IRB form before answering any questions, and each reporter understood they would be given a pseudonym to protect their anonymity. The researcher used a semi-standardized interview guide, meaning the questions were scripted, but wording was flexible and the researcher could alter questions to be more suitable to the participant (Lindlof and Taylor, 2002; Berg, 2009). The interview schedule was conducted in three different sections: important but non-sensitive questions, sensitive questions, and validating questions to ensure the researcher understood the participant (Berg, 2009). Each interview lasted approximately 30 minutes and addressed experience with foodborne illness, corporate policy on reporting on food safety and/or agricultural issues, and preferred food safety information sources. All interviews were audio taped then transcribed. Lindlof and Taylor (2002) stated the "researcher interacts with the data on the page or the computer screen and tries to make conceptual sense of these layers upon layers of discourse and social action" (p. 209). As interview transcripts were analyzed, data were reduced and put into categories using NVivo 8.0. This created concepts and themes to make meaning from the wealth of data (Lindlof & Taylor, 2002). During data analysis, the researcher wrote self-reflexive memos to enrich the analysis process. After the first phase of coding, there were 19 categories. The researcher then re-analyzed using open and axial coding to further reduce the data.

Trustworthiness

Trustworthiness was established by credibility, transferability, dependability, and confirmability of the researcher, methods, and findings (Lincoln & Guba, 1985). Credibility can be accomplished through triangulation, and in this study, triangulation was achieved through different sources providing similar information to verify the findings (Lincoln & Guba, 1985). Comparing the interview transcripts amongst the various participants verified the findings, and researcher bias was also addressed (see following section) to also achieve credibility. Rich descriptions of the findings are provided to achieve transferability (Bloomberg & Volpe, 2008). Dependability and confirmability were achieved with an audit trail of interview recordings and transcriptions, NVivo files, and news transcripts. Dependability was also achieved through protecting the subjects' anonymity and assigning pseudonyms to the participants.

Researcher Bias

"The investigator as a human instrument is limited by being human—that is, mistakes are made, opportunities are missed, personal biases interfere. Human instruments are as fallible as any other research instrument" (Merriam, 1998, p. 20). In qualitative research, it can be easy for the researcher to choose pieces of interviews that reflect their own personal beliefs (Lincoln & Guba, 1985); therefore, personal bias must be addressed. As stated earlier, the researcher was a television reporter, and somewhat identified with the reporters that were interviewed. The researcher also grew up on a farm and almost always sides with the farmer. Finally, the researcher preferred the ABC News Network.

Findings

"Human beings construct their perceptions of the world…no one perception is 'right' or more 'real' than another" (Glesne, 2006, p. 7). Each participant had his or her own perceptions of the truth. The interviews were conducted in April 2009, and many reporters who covered the 2008 *Salmonella* outbreak also covered the *Salmonella* outbreak that occurred in peanut butter in early 2009. Several reporters referenced the peanut butter outbreak in their responses.

There were 12 participants. Izzy, Lucy, Charlie, and Sally were network reporters based in Washington, DC; Linus was a network producer in Washington. Lucy, Charlie and Linus were interviewed in a group setting. Tommy, Christina and Meredith were producers at a local television station in a large city near Washington; Richard was an investigative reporter that worked at the same station. Mark and Derrick were reporters at a local television station in a large Texas city; George worked in the same Texas city but at a different station.

Findings in Relation to Research Question 1

Research Question 1 asked "What are the inputs that influence the way television media report food safety information based upon the 2008 *Salmonella* outbreak in tomatoes and jalapenos?" Four major themes emerged that could have been inputs in the way the media framed the 2008 *Salmonella* outbreak: determining news value, opinions about the farmers involved in this story, opinions about the government/FDA, and opinions about the United States food supply.

Based upon the interviews, covering a foodborne illness outbreak depends on a number of factors before inputs that influence a frame are ever considered. Popularity of the food being recalled, news of the day, management's definitions of news, frequency of reporting the story, and audience opinions are all considered before a story is covered.

> LUCY: It depends on how popular the food is…peanut butter is a popular food. It depends on what other news is going on that day. I mean, we actually fought to get the peanut butter story on for a long time before they finally jumped on it….They (news management) were not really that interested until it gathered some steam.

Often, a news organization may not report on a story repeatedly because the audience may tune out the information.

> IZZY: There's a weariness factor, too, it's sort of like the Iraq war, you know, even though things continue to go on there, after a while, the news divisions get weary because the audience gets weary, and they have a hard time distinguishing, "gee, isn't this more of the same?" kind of thing. So we really do have to think hard and discipline ourselves to do the homework, to realize, "wait a minute, there has been a turning point, something important has changed, or has happened, we need to report on this again."

During the interviews, a common ideology of support for the tomato farmers emerged. Not one reporter thought the recall was due to the farmers, and most of the reporters felt sympathy toward the farmers affected.

> DERRICK: I grew up on a farm, and I understand how things are raised, and from that part of it, the production end of it to selling things and market it…I know most people are

doing it right…I don't think anybody wants to make the public at large sick because of the food they eat.

SALLY: It just devastated the industry, and it ended up not even being tomatoes, it was jalapenos from another country. And that's one of the challenges in covering this and dealing with this, it just completely devastated the poor tomato farmers out there and it wasn't even their fault.

IZZY: Of course we have to reach out to industry…but particularly in the case of the tomatoes, they had a lot to say and they turned out to be right. How 'bout that? You know, it's easy to be skeptical of the industry that's under attack, because they have money to lose, but there was an example where gee…they were right.

CHARLIE: Florida was really ticked 'cause they had just started to harvest, and their fields had been checked….I mean they were really ticked that FDA hadn't cleared them because there was **no way** (it could be their tomatoes). Their tomatoes were already in the system, and people were getting sick back in April… I mean, there were people screaming at them from Florida, because their crops are sitting in the warehouse, and if they don't get them moving, that's a whole season of work that's lost.

A common opinion of the media members interviewed for this study was that the FDA needed change. Some of the reporters acknowledged that the FDA does what it can with the resources available. However, the consensus was that FDA needed to improve its communication strategy and operational structure, including but not limited to more funding and more inspectors.

IZZY: I recognize that the FDA's job, this sort of treasure hunt, slash episode of CSI that they have to do when these food outbreaks happen is really difficult and (they are) relying on the faulty memory of human beings to do a lot of that tracking. So on that, I don't really fault them on that part, because I think that given the systems that are in place now, they do as well as they can.

IZZY: How they communicate, though, to the media and to the public, is flawed. And there was a very odd thing that they were doing where they were trying to make it clear that some tomatoes were fine and others were not in order to not decimate the entire industry. They realize that they did sort of a bumbling job of it and so it wasn't effective, and it decimated the industry regardless.

Some of the reporters stated that major food recalls seem to occur every year. Reporters mentioned pet food, spinach, tomatoes, peanut butter, pistachios, and the Jack In The Box recalls.

LUCY: It's the same story year, after year, after year, with a little bit of a difference, but they just can't seem to get it right and fix the problem. And I felt that way with the pistachios, I'm like "come on people, this is getting ridiculous!" I guess, given all the food that is produced, there isn't more foodborne illness, perhaps. But, you know, they gotta get it right, especially now, because food comes from so many places

CHARLIE: I don't think the story is going away anytime soon… .We'll always have this (bacteria) in some of our food. It's just a question of how much and how bad it is. I think we learn a little bit, I think Jack In the Box, in my knowledge that's the first time I learned *E-coli* can be on the meat, but once you grind it, it's in the entire hamburger, versus a steak, if it had *E-coli* on it, you grill it, you kill it. So we learned something then, and it generally changed the way hamburgers are cooked in this country. So there are these marks where we learn, and we do things differently, but I don't think that it's ever going away.

Food can be a very emotional subject, especially when the story is about food making other people sick, possibly causing deaths. Some of the reporters expressed emotions about food safety; however, it was in relation to the peanut butter recall rather than the tomato recall.

CHARLIE: You know, the one that makes me mad…these (agricultural) producers try, they really try. It's…like the peanut one—**that** makes me angry. Because this guy (the Georgia peanut butter plant owner) knew that he had problems with his plant…those are the ones that really, if there's any emotion, it's the fact that…you know, I do my job and it's important that I get it right. If you're producing food for somebody, it's important that you get it right, and anybody that just knows that they're not doing it right, **that** makes me angry.

Two of the participants stated they received a foodborne illness from food eaten in Mexico. George, a former network reporter, frequently traveled internationally. He said that he had eaten foods that were probably not safe, some of them in rural Mexico, and never became ill. However, he stated that he became violently ill after eating at a five-star hotel in Mexico City. Charlie also had a foodborne illness and explained it to Lucy.

CHARLIE: Mexico.
LUCY: Mexico? Well that's a little different, that's different. Have you had food poisoning in the US?
CHARLIE: Yeah, but mild compared to what I had in Mexico.
RESEARCHER: Do you know what you ate in Mexico?
CHARLIE: I believe it was lettuce; it was probably the water on the lettuce. And I've had food poisoning in Iraq as well. That one, not as bad as the Mexico one…it was bad.

Aside from a few mentions of seafood, sprouts, and certain uncooked foods, the reporters were not worried about eating food in the United States.

RESEARCHER: Are there any foods that you avoid?
CHARLIE: Here in the U.S.? Yeah, there's nothing I won't eat.

Finally, the reporters interviewed for this study mostly felt the U.S. food supply was safe, and the majority felt safe eating nearly all foods in the U.S.

DERRICK: Think of all the things we eat on a regular basis, the eggs, the milk the cheese, beef, chicken, poultry…so much stuff…bread…all this stuff that we eat on a daily basis, that never, ever, ever seems to have any kinds of problems, and when it does, it's usually very limited….There's problems throughout the whole system, but those are few and far between, so I don't look at my food and say "Hey is this going to kill me?" I don't live that way. I think our food supply is generally safe.

Findings in Relation to Research Question 2

Research Question 2 asked **"**when covering the 2008 *Salmonella* outbreak, were there interview sources that reporters were more inclined to use, and if so, what were their opinions about those sources?**"** The FDA was a highly used source in the 2008 Salmonella outbreak, yet when asked where they would search for information during a food recall, only Sally, Izzy, and Lucy specifically mentioned the FDA, the other participants talked about other sources.

> IZZY: I guess the first thing would be just to get the nuts and bolts of what the recall is and that would be the FDA Web site and then from there, we try to look at some of the groups that are critical of FDA to get the back story.

Many of the participants talked about using the Center for Science in the Public Interest, a consumer watchdog group.

> LUCY: The Center for Science in the Public Interest, they're knowledgeable, they're quick, they're down the street, they'll come here, and ….I would say CSPI is probably our first call, usually on these stories.

> SALLY: We interview them (CSPI) fairly often. Sometimes I'm a little selective about either the topics on which we interview them or the information we get. Their name in DC is the 'food police'….I don't think they're inaccurate at all, I don't want to give that impression…but they have a reputation for sort of pushing their agenda maybe more so than some mainstream groups. They're always **really** happy to run over and be on camera. So sometimes we use them, sometimes we don't. But they are helpful, I mean they can give you a lot of information, but they do bring to the forefront consumer issues that need to be dealt with.

> IZZY: The only caveat is again, Center for Science in the Public interest is just an easy resource because we know all the people there, we deal with them all the time, and they're always on top of these issues, so they're somebody we often interview, but we try actually not to interview the same players for every story because that's not great reporting.

Several reporters stated that they like to interview a representative of the industry under fire in order to get both sides of the story. They also liked using academics.

> SALLY: A lot of times, people say, "the industry," like they're kind of like the bad guy, but they can actually be very helpful, and particularly because the government relies so heavily on the industry to police itself. If you go to (certain industry's Web sites) you can find out 'where are the growers, where are the processors'….So those Web sites, and those organizations, I actually find to be very helpful.

> IZZY: I prefer academics, you know, if the government isn't doing a great job…we try to start with the government because they're the ones issuing the recall, and then I prefer for context from academic types, because I think they're just in it for knowledge and truth.

Conclusions and Recommendations

According to Scheufele (1999), inputs combined with sources build the frames that are presented in the news (See Figure 1). In analyzing if inputs influenced the way reporters told the 2008 *Salmonella* story, four themes emerged: determining news value, opinions about farmers, opinions about the FDA/government, and opinions about the safety of the U.S. food supply.

According to Scheufele's (1999) model, organizational pressures can influence the frame of the story, but it can also influence the news that gets covered each day. The news organization's management and opinions about the audience and the situation can lead a writer to give a story a certain spin (Neuman et al., 1992). However, according to Lucy, corporate pressures or plans do not usually decide which stories get covered and which do not.

> LUCY: It depends on how popular the food is….I mean, we actually fought to get the peanut butter story on for a long time before they (news management)finally jumped on it. …They were not really that interested until it gathered some steam.

Organizational pressure did not appear to have an influence on the decision to cover the 2008 *Salmonella* outbreak, which was contradictory to that portion of Scheufele's model.

The participants in this study did not appear to have negative attitudes toward agricultural producers. At times, it seemed as if the reporters were siding with the producers. These findings contradict previous literature about the media being negative toward agriculture (Ruth, Eubanks, & Telg, 2005; Ashlock, Cartmell, & Kelemen, 2006; King, Cartmell, & Sitton, 2007), but the attitudes of the reporters toward agriculture in the 2008 *Salmonella* outbreak were all supportive.

Some of the participants acknowledged the FDA had a lofty task of regulating both prescription drugs and food products; even so, some participants did not approve of the way the FDA communicated messages about the 2008 *Salmonella* outbreak.

> SALLY: They (FDA) start giving batch numbers, and quite frankly, the average person does not go into their cabinet, turn over their can or bag of spinach or whatever, or go online and make sure that the numbers match. The average person says "there's a problem with spinach, I'm not eating it".…Now you've already frightened people, so now that you have more specific information, the industry suffers because people just aren't eating the product.

A study from Rutgers University corroborated Sally's statement. The study found that a small percentage of consumers checked their pantry products to determine if they had been recalled, and many consumers were confused about which products to throw away (Cuite et al., 2009).

Irlbeck and Akers (2009) found that CNN openly questioned the quality and safety of food coming from Mexico during a *Salmonella* outbreak. This made the researcher wonder if the CNN hosts had a negative attitude about Mexican imports due to an illness contracted there; therefore, the researcher asked each participant if they ever had food poisoning. George and Charlie both said they had become ill after eating food in Mexico; however, Irlbeck and Akers (2009) claimed that neither ABC, CBS, nor NBC reported against Mexican food imports, so this bad experience with food in Mexico likely did not influence frames.

Irlbeck and Akers (2009) found that the FDA was the most frequently used television news source during the 2008 Salmonella outbreak. They also found that David Acheson, commissioner of the FDA, was interviewed the most from the agency. Consumers and tomato farmers were interviewed second and third most often, respectively. The Center for Food Safety (CFS) and the Center for Science in the Public Interest (CSPI), both non-profit public interest advocacy groups, were interviewed frequently. In previous food recall stories, the groups appeared to be working against certain agricultural groups; however, Irlbeck and Akers (2009) found the two groups to be supportive of the tomato farmers. Baran and Davis (2009) stated that interest groups are experts at getting their frames presented.

Sources provide facts, figures, opinions, perspective, and other valuable information, but sometimes the information might not be accurate. For example, research found that Caroline Smith DeWaal of the Center for Science in the Public Interest, a frequent interviewee during the 2008 *Salmonella* crisis, presented inaccurate information during the Wendy's crisis when a human finger was allegedly found in a bowl of chili (S.A. Irlbeck & Oshel, 2008). Irlbeck and Akers (2009) found that during the 2008 *Salmonella* outbreak, DeWaal's information was accurate, but using sources that have provided poor information in previous stories can reduce the credibility of the news organization.

Anderson (2000) found that health activists were quoted in the media five times as often as food scientists. Using activist groups as sources can give the group momentum to "develop strategies to gain the media limelight around food safety issues for the purpose of gaining public support for their continued existence" (Eyck, 2000, p. 45). News networks like to use interview sources that are predictable, reliable, and are good on camera (Cooper & Stoley, 1990). Lucy commented that she prefers to use one particular organization for that reason.

> LUCY: The Center for Science in the Public Interest, they're knowledgeable, they're quick, they're down the street, they'll come here, and....I would say CSPI is probably our first call, usually on these stories.

The researcher had experience similar to Lucy's. Getting articulate, qualified sources to agree to an on-camera interview can be difficult. If there was a knowledgeable, dependable source that would commonly agree to an interview, that person would get the first call. Shoemaker (1984) argued that interest groups are creative at gaining media attention in order to promote their stand on an issue. Izzy and Sally both stated that they like to use a variety of sources for interviews, and when possible, they prefer university experts because they are usually an independent, unbiased source.

It is important to note that this story stretched over a period of two months, and although one individual may have been interviewed six times, the viewers probably did not notice the frequency of the person being interviewed because of the lenghthy time span of the story, and viewers typically watch one network.

Discussion

Reporters are human, they are consumers, and some are parents. Reporters have opinions and feelings toward issues just like every other American (Face-off, 1987). There is an obligation to remain objective in reporting and report both sides of the story, yet sometimes reporters' personal opinions and ideologies are injected into a news script and they may not realize it. Framing is not a bad thing—a news frame is the angle a reporter chooses to take with the story. News frames are acceptable and expected—as long as they are fair and objective.

Scheufele's model (1999) stated that organizational pressures can influence news frames; however, according to the reporters, organizational pressures had very little to do with covering the *Salmonella* story.

Recommendations

For practitioners, the researcher recommends a proactive approach to food safety communications. Eyck (2000) suggested that food safety experts make contacts with all types of journalists to pitch food safety story ideas. If scientists fail to make contact with the media, Eyck (2000) warned that agricultural and food industry professionals and communicators could expect "storms of negative press coverage and challenging negative images" (p. 45). In order to be proactive with preventative food safety messages, it is important for communicators to be diligent and make contacts with media. Sally provided an example.

> SALLY: It would be very helpful…if someone contacted me and said "Hi, I'm the media relations person for the agricultural department at (a university), we've got these experts" or e-mail me "we've got these experts who are available on stories that are often in the news. We've got a studio here…we can get them in front of a camera and do interviews with you by satellite." Extremely helpful. Because we're based in DC, and all news does not happen in DC, particularly when it comes to food safety.

Although the Center for Science in the Public Interest provided incorrect information in previous stories, they are experts at getting their message out. Several participants stated they are partial to CSPI because the organization provides great information and is usually available for interviews. Agricultural communicators can learn from this example—follow CSPI's lead and be proactive with the media. Provide information, even when there is not crisis; ensure the reporters and news managers know about you and your organization; and if there is a crisis, contact the reporters and offer information or interview subjects.

For future research, a study is underway for a content analysis of the television stories reported during the 2009 peanut butter recall. This case study will provide background for a case study on risk and crisis communications where the public relations professionals who work for the tomato growers, FDA, and Agricola Zaragoza will be interviewed to learn how they handled the crisis. The research could also build upon this framing study to determine how those affected by the tomato recall reacted to the television news coverage. Much can also be learned about how the industry dealt with the recall in terms of communications strategy so that agricultural communicators can develop a model for food safety crisis communications.

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The Effect of Educational Materials on the Perceptional Attitudes of Ground Beef Consumers Concerning Lactic Acid Bacteria

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Abstract

According to the Centers for Disease Control, after eating contaminated food, people can develop anything from a short, mild illness, often mistakenly referred to as "food poisoning," to a life-threatening disease. It is estimated that 76 million Americans get sick, more than 300,000 are hospitalized, and 5,000 people die from foodborne illnesses each year (CDC, 2003). Lactic acid bacteria were developed as a ground beef additive to reduce the prevalence of E.coli O157:H7. This study follows Rogers' (1995) diffusion of innovations theory to investigate the knowledge levels of lactic acid bacteria in ground beef consumers and to investigate the effect of educational information on the adoption rate of lactic acid bacteria. This study was comprised of three main objectives and conducted a static-group comparison design to obtain information about the effects of educational materials on consumers' perceived differences of acceptability of the USDA approved statements about lactic acid bacteria. Data were collected using a convenience sampling method limited to a desired population at four United Supermarket grocery stores in a single, southwestern community, on July 10-11, 2006. Respondents were solicited from customers actively selecting packages of ground beef at the store meat counter. One-hundred fifty-five individuals completed the researcher developed instrument. Researchers discovered the demographics of ground beef consumers as well as their buying habits. Optional labels were presented to consumers who rated choices on a four-point likert scale. Three possible choices were determined to be statistically different than a plain label used as a control. Three labels were also not statistically different than the control, providing ground beef companies with alternatives for labeling choices. Educational material about lactic acid bacteria was presented to every other respondent before completion of the instrument to determine the effectiveness of educational material on consumer perceptions about the inclusion of lactic acid bacteria in ground beef.

Introduction

Currently, the United States produces nearly 25 % of the world's beef supply. With the world population at an estimated 6.4 trillion people and projected to grow to 9.4 trillion people by 2050 (U.S. Census, 2006), beef supplies will need to increase to provide for the projected population. Each year there are an estimated 76 million cases of food-borne illness, 325,000 hospitalizations, and 5,000 deaths from food-borne diseases (Mead et al., 1999). The estimated annual cost and lost productivity in the United States and Scotland caused by *E. coli* O157:H7 averages between $5.8-$10 per patient (Buzby, Roberts, Roberts & Upton, 2000). Therefore, as beef consumption increases, Salmonella and *E. coli* O157:H7 cases are expected to rise. To combat this rise, a mixture of lactic acid bacteria was developed that has shown to reduce deadly food borne pathogens such as Salmonella and *E. coli* O157:H7 in processed beef and poultry up to 99.99 %. However, labeling of these new bacteria is required by the Food and Drug Administration. The importance of this study is to determine the most effective labeling for lactic acid bacteria according to FDA regulations, thus increasing the consumers' likelihood of choosing a product with the lactic acid and therefore decreasing food borne illnesses.

As millions of Americans sit down to dine on a steak dinner, what they do not recognize is that their meal could be contaminated with harmful pathogens. Farm animals are considered the primary reservoir for many of these pathogens. The question facing the American beef industry today is, "What can the beef industry do to ensure the safety of the consumers' beef from the farm to the table? One of the biggest pathogens of concern for the beef industry is *E. coli*. *Escherichia coli*, or *E. coli* for short. *E. coli* have hundreds of strains. Some strains are beneficial to humans and actually aid in the digestion of food and produce both Vitamin K and B-complex vitamins; however, there are a few strains that cause human illness (NCBA, 2004).

E. coli O157:H7 is one of the deadliest strains of *E. coli* because it produces toxins that damage the human intestine by attaching the lining. Children, seniors and people who may have immuno compromised systems are especially at risk for *E. coli* O157:H7 poisoning. *E. coli* O157:H7 is difficult to control because it adapts and survives in different environments (NCBA, 2004).

"Standing and free-flowing feces, soil and animals all can harbor *E. coli* O157:H7. *E. coli* O157:H7 can be found in many species but particularly cattle. Anytime we eat something, drink something, or touch something that has been either a part of or anywhere near cattle, there is always the potential to consume *E. coli* O157:H7. Once consumed, the bacterium then moves through the digestive tract and settles in the intestine and could lead to illness. Examples of ways humans might introduce *E. coli* O157:H7 into their bodies include eating contaminated, uncooked meats like salami or ground beef, unpasteurized milk or fruit juice, or produce, such as sprouts or lettuce that have been cross-contaminated" (NCBA, 2004).

The beef industry understands the impact of *E. coli* O157:H7 and human consumption of beef. Ted Schroeder, agricultural economist, reports from 1991 to 1999, an estimated $1.6 billion in loss of demand for beef products because of safety concerns. In response, $20 million have been dedicated to safety research through the checkoff system and in addition, $400 million from the top 10 beef packing companies. "The amount of money *E. coli* O157:H7 costs the industry is staggering. New solutions to lower *E. coli* O157:H7 will cut both costs and lost consumer opportunity dramatically. However, the solutions must be easy to implement, economically feasible and readily available. Steve Kay, Cattle Buyers Weekly, reports that government and industry have spent at least $65 million since 1993 on *E. coli* O157:H7 research. Packers have also incurred an estimated $250 million in increased operating costs due to changes at the processing plant to improve beef safety" (NCBA, 2004).

The beef industry has techniques and technology to reduce harmful pathogens in meat at their disposal: trimming, steam-vac, steam pasteurization and acid wash. However, with the new technology that has been proven effective in eliminating 99.9 % of *E. coli* O157:H7 and other harmful pathogens, the consumers only have to accept the technology. Without knowledge of consumers' perceptions, efforts to diffuse this valuable technology could fail. Lactic acid bacteria were developed as an additional intervention to prevent consumers from becoming infected with harmful pathogens. The FDA has approved this additive for human consumption but requires labeling of the additive. This study's purpose was to investigate what consumers will accept about sufficient labeling.

Theoretical/Conceptual Framework

Diffusion of Innovation

Agricultural education plays a large role in influencing people to accept or reject new technologies. According to Rogers' (1995), diffusion of innovations theory can be understood as "diffusion as the process by which an innovation is communicated through certain channels over time among the members of social change" (Rogers, 1995, p. 10). The four main elements are the innovation, communication channels, time and the social system.

For this study, Rogers' Innovation-Decision Process (see Fig. 1) is crucial to the investigation of how educational materials affect ground beef consumers' perceptions of acceptability about lactic acid bacteria in ground beef products. Rogers (1995) determined the innovation-decision process is the "process through which an individual (or other decision-making unit) passes from first knowledge of an innovation, to forming an attitude toward the innovation, to a decision to adopt or reject, to implementation of the new idea, and to confirmation of this decision (p. 163).

Communication Channels

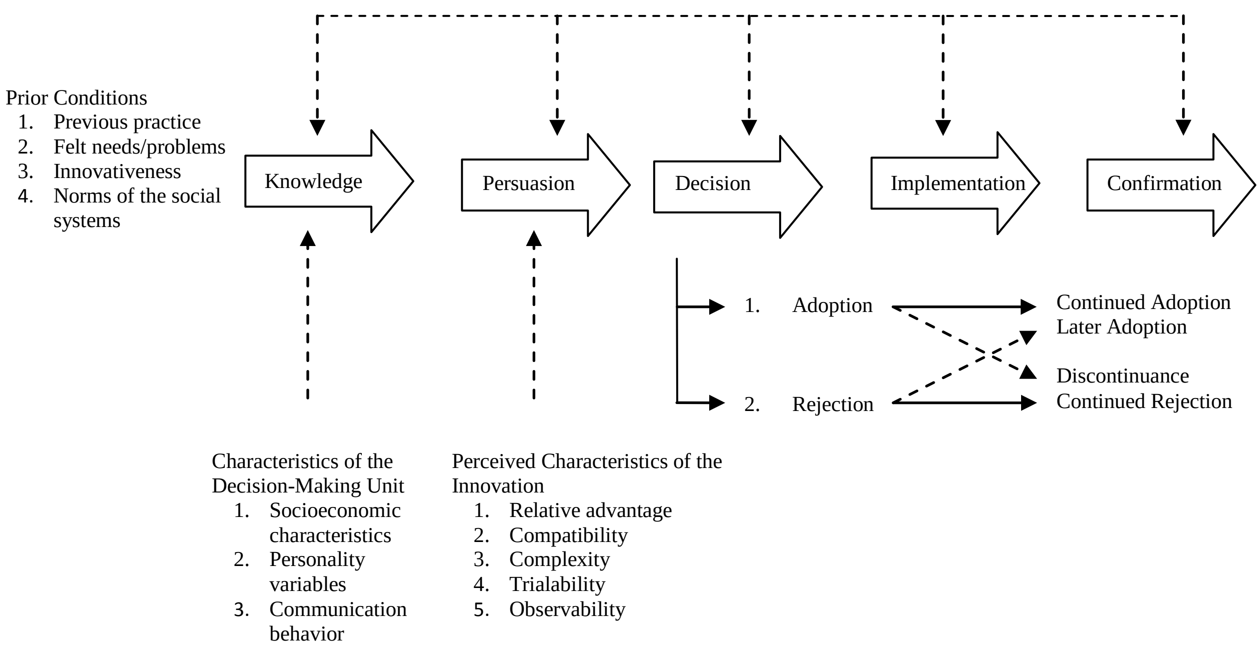

Figure 1: A Model of Stages in the Innovation-Decision Process (Rogers, 1995).

The rate of adoption is also determined by how fast one moves through the process. The five stages of this process are:

1. Knowledge occurs when an individual (or other decision-making unit) is exposed to an innovation's existence and gains some understanding of how it functions.

2. Persuasion occurs when an individual (or some other decision-making unit) forms a favorable or unfavorable attitude toward the innovation.
3. Decision occurs when an individual (or some other decision-making unit) engages in activities that lead to a choice to adopt or reject the innovation.
4. Implementation occurs when an individual (or other decision-making unit) puts an innovation into use.
5. Confirmation occurs when an individual (or some other decision-making unit) seeks reinforcement of an innovation-decision already made or reverses a previous decision to adopt or reject the innovation if exposed to conflicting messages about the innovation (Rogers, 1995, p.162).

According to Rogers, "if a change agent wishes to speed up the process by which innovations are adopted. One method of doing so is to communicate information about new ideas more rapidly or more adequately so that knowledge is created at an earlier date" (Rogers, 1995, p. 198). This study takes a closer look at the knowledge level to analyze whether educational materials increase a subject's likelihood of adopting lactic acid bacteria versus those subjects that did not receive educational materials.

The Beef Industry

The U.S. beef industry is currently known for the safest, highest-quality meat in the world, but it wasn't always like that. At the beginning of the twentieth century, meat-packing companies entered the national limelight when unsanitary practices became known. Now, the beef industry applies scientific knowledge and technology to food manufacturing, which creates the highly sophisticated industry we have today (Aberle, Forrest, Gerrard & Mills, 2001).

The University of Göttingen conducted a study over consumer perceptions of fresh meat quality: cross-national comparison. This examines six European countries in order to compare consumer behaviors toward meat and their perceptions of fresh meat quality. The methodology consisted of a telephone survey developed by a focus group administered to 500 households in Germany, Ireland, Italy, Spain, Sweden, and the UK. The study assessed that 'price' was distinctly considered to "be the least helpful quality indicator in all countries, except in the UK. For beef and pork, the 'place of purchase' was one of the most important quality cues in all countries except in Sweden and the UK, while among the intrinsic factors, 'color' was the most important for all types of meat…. To sum up the results concerning consumers' evaluation of the given safety indicators, it becomes obvious that "freshness" plays a major role in assessing the safety of beef, pork and chicken. Therefore, it would be advisable for producers and retailers to communicate 'freshness' to the consumers (p193)."

Food Labeling

Meyers (2005) conducted a study on consumers' perceptions of genetically modified food labels. After conducting a qualitative study using three focus groups centered on discovering what Arkansas consumers wanted to see on genetically modified food labels using the Elaboration Likelihood Model, she found that overall, consumers wanted labels for GM ingredients and suggests that labels "include a consistent biotechnology symbol and contact information where consumers can learn more about this type of product. Participants suggested placing the biotechnology symbol on the front of the package and any additional information on the front or near the nutrition label" (p. 82).

Purpose and Objectives

The purpose of this study is to analyze current consumer perceptions on meat purchasing preferences and determine the effect of knowledge levels on adoption rate (Rogers, 1995) of lactic acid bacteria. The objectives developed for this study are:

1. Determine demographic characteristics and buying habits of ground beef consumers.
2. Define ground beef labels containing lactic acid information that consumers find as acceptable as a current ground beef label.
3. Determine the impact of educational material on consumer perception of ground beef.

Procedures

Population and Sample

The target population of this research was ground beef consumers at United Supermarket stores in a southwestern community. The four stores selected for this study were determined by company executives based on stratification of socio-economic demographics of the clientele. United Supermarkets runs and operates 48 stores under three distinct brands: United Supermarkets, Market Street, and United Super Marcado. Almost 1 million guests shop at those stores every week in 26 cities across the southwest United States. There are nine United Supermarkets in the area of this research study.

The researcher used a convenience sample designed to maximize the total responses while maintaining a balance between the four stores. Researchers were allotted four hours in each store with a goal of receiving 25 completed instruments at each store. The researchers, however, remained in each store for the maximum time regardless of the number of instruments completed. Frame error, or the discrepancy between the intended population and actual population, was controlled by a purposive sampling of United Supermarkets stores. Two United stores were selected because of their status as a store that services consumers in a low-income area, and two additional stores were selected based on their serving a high-income area. Sampling error was minimized by selecting a sample size that would represent the population.

Research design and data analysis

According to Dillman (2000), "one of the most significant barriers to mail-back questionnaires is the lack of an adequate population list" (p. 246). Dillman (2000) suggested when a researcher has such a large unknown population; calling random numbers may not be the adequate method. Members of the desired population tend to gather at a point of interest that makes in-person interviews an effective process of finding participants and asking for their involvement.

The researchers approached only consumers considering beef at the meat counter in the grocery store. The researcher then explained the purpose of the survey research, the importance of their participation that all responses would be kept confidential, and participation would be voluntary. If the subject agreed, the researcher handed the subject the survey instrument to be completed. Every other subject was given a business card with unbiased information about lactic acid bacteria to read before filling out the instrument. Once the instrument was completed, the researcher then allowed the participant to select an incentive item that was on display. The instrument was coded by store and time of completion.

A static-group comparison design was used because of two main characteristics: researcher participants are not randomly assigned to the two treatment groups; a posttest with no pretest was administered to both groups (Gall, 1996, p. 507).

Instrument

This study developed a new survey instrument to determine the demographics of beef consumers, buying habits of ground beef, purchasing preferences of ground beef based on product label, perceptional differences of acceptability of ground beef labels based on various lactic acid statements, perceptional differences of ground beef ingredients based on various lactic acid statements, and to determine the impact of educational materials on consumer perceptions of ground beef labels and ingredients.

Part one contained eight items regarding subject and store demographics. Part two contained 10 Likert-type items requiring respondents to assess their buying preferences of ground beef. Part three included eight Likert-type questions designed to measure perceptional differences of several different lactic acid bacteria statements approved by the United States Department of Agriculture for packaging ground beef with lactic acid bacteria additives. This part featured eight beef labels with eight different statements that asked subjects to rate their likelihood of buying ground beef with that label on the product. Part four also measured perceptional differences of 17 items included in ground beef. The fifth part of the instrument was to determine the impact of educational materials on consumer perceptions of ground beef labels and ingredients by placing a business card sized paper with unbiased information about lactic acid bacteria.

A pilot test was conducted on graduate students and professors that consume ground beef on a regular basis. The Cronbach’s Alpha was .622 for the first eight questions regarding consumers’ perceptions about ground beef based on several lactic acid bacteria additive statements. For the next 20 questions based on perceptional differences in ground beef ingredients, a Cronbach’s Alpha of .866 was reported. The reliability coefficient in the .8 range is typically what is considered acceptable, Nunnally (1967) suggest that .5-.6 would be adequate in early stages of research.

Findings

Objective One

The first objective of this study was to describe demographic characteristics and buying habits of ground beef consumers. Table 1 describes the education, gender, and ethnicity of ground beef consumer. The majority (63.9%, n = 99) of the sample was reportedly female consumers. The reported education levels were comprised of the following: college degree (38.1%, n = 59), some college (34.2%, n = 53), high school degree (16.1%, n = 25), and some high school (9%, n = 14). The reported ethnicities were comprised of the following: Caucasian (67.7%, n = 105), Hispanic (14.2%, n = 22), Native-American (7.1%, n = 11), African-American (5.2%, n = 8), Asian (3.9%, *n* = 6), and other (1.3%, *n* = 2). Also, age for the sample population ranged from 16 years of age to 84 with a mean of 49.1.

Table 1
General Demographic Characteristics of Ground Beef Consumers (N = 155)

Characteristics	Frequency	%	Mode
Gender			Female
Female	99	63.9	
Male	53	34.2	
Did Not Report	3	1.9	
Education			College Degree
College Degree	59	38.1	
Some College	53	34.2	
High School Degree	25	16.1	
Some High School	14	9.0	
Did Not Report	4	2.6	
Ethnicity			Caucasian
Caucasian	105	67.7	
Hispanic	22	14.2	
Native-American	11	7.1	
African-American	8	5.2	
Asian	6	3.9	
Other	2	1.3	
Did Not Report	1	.6	

The second part of objective one, buying habits, is reported by Table 2. When consumers were asked how often they read beef labels, 35.5% (*n* = 55) said they read them sometimes, followed by often (34.8%, *n* = 54), always (23.2%, *n* = 36), and not at all (6.5%, *n* = 10). They were then asked how often they ate beef, 63.9% (*n* = 99) said they ate beef weekly, daily (25.2%, *n* = 39), monthly (7.7%, *n* = 12), and yearly (2.6%, *n* = 4). Consumers chose freshness (76.1%, *n* = 118) over ingredients (7.7%, *n* = 12) and cost (10.3%, *n* = 16) when asked what was most important to them when choosing ground beef for consumption.

Table 2
Descriptive Statistics of the Buying Habits of Ground Beef Consumers (N = 155)

Characteristic	Frequency	%	Mode
How often do you read beef labels?			Often
Not at all	10	6.5	
Sometimes	55	35.5	
Often	54	34.8	
Always	36	23.2	

Continued next page

Table 2 continued

Characteristic	Frequency	%	Mode
How often do you eat beef?			Weekly
Yearly	4	2.6	
Monthly	12	7.7	
Weekly	99	63.9	
Daily	39	25.2	
Most important			Freshness
Freshness	118	76.1	
Ingredients	12	7.7	
Cost	16	10.3	

They were then asked four questions about how often they look at a given characteristic when buying ground beef (Table 3). When considering freshness, consumers reported: always (72.3%, *n* = 112), often (20.6%, *n* = 32), seldom (5.2, *n* = 8), and never (1.3%, *n* = 2). When looking at price, they reported: always (60.6%, *n* = 94), often (25.2%, *n* = 39), seldom (9.7%, *n* = 15), and never (1.9%, *n* = 3). When looking at fat content, consumers reported: always (58.1%, *n* = 90), often (27.1%, *n* = 42), seldom (9.7%, *n* = 15), and never (3.9%, *n* = 6). And finally, when asked about nutritional information, consumers reported: always (32.3%, *n* = 50), often (30.3%, *n* = 47), seldom (27.1%, *n* = 42), and never (8.4%, *n* = 13).

Table 3
Importance of Beef Characteristics on Buying Habits of Ground Beef Consumers (N = 155)

Characteristic	Frequency	%	Mode
Freshness			Always
Always	112	72.3	
Often	32	20.6	
Seldom	8	5.2	
Never	2	1.3	
Price			Always
Always	94	60.6	
Often	39	25.2	
Seldom	15	9.7	
Never	3	1.9	
Fat Content			Always
Always	90	58.1	
Often	42	27.1	
Seldom	15	9.7	
Never	6	3.9	
Nutritional Information			Always
Always	50	32.3	
Often	47	30.3	
Seldom	42	27.1	
Never	13	8.4	

Objective Two

The second objective was to define ground beef labels containing lactic acid information that consumers find as acceptable as current ground beef labels. Table 4 represents the statistics acceptability of the ground beef labels that the subjects were asked to rate. The Plain Beef Label served as the control for this objective. On a scale of 1 (completely unacceptable) to 4 (completely acceptable) this label had a mean of 2.99 and a standard deviation of .808.

Table 4

T-tests of possible ground beef labels compared to control. (N = 155)

Label Description	*M*	*SD*	*t*	*p*	*Interpretation*
Plain Beef Label	2.99	.81	--	--	Control
Lactic Acid Bacteria to Reduce Harmful Microorganisms	3.00	.89	.138	.891	Acceptable
Lactic Acid Cultures to Reduce Harmful Microorganisms	2.95	.82	-.649	.517	Acceptable
Lactic Acid Bacteria to Reduce Food-borne Pathogens	2.92	.86	-1.002	.318	Acceptable
Lactic Acid Bacteria to Reduce Microorganisms	2.76	.87	-3.230	.002	Unacceptable
Lactic Acid Cultures	2.51	.90	-6.527	.000	Unacceptable
Lactic Acid Bacteria	2.32	.97	-8.607	.000	Unacceptable

Lactic Acid Bacteria to Reduce Harmful Microorganisms' mean was 3.00, a standard deviation of .89. The mean for Lactic Acid Cultures to Reduce Harmful Microorganisms was 2.95 with a standard deviation of .82. Lactic Acid Bacteria to Reduce Food-borne Pathogens reported a mean of 2.92, a standard deviation of .855. The mean for Lactic Acid Bacteria to Reduce Microorganisms was 2.76, a standard deviation of .872. Lactic Acid Cultures reported a mean of 2.51, a standard deviation of .898. Lactic Acid Bacteria's mean was 2.32, a standard deviation of .966.

T-tests were conducted to evaluate the hypothesis that there would be no significant differences between the plain beef label (control) and the proposed statements on lactic acid bacteria. The results of the t-tests are shown in Table 4. The means of three label statements were significantly different at the test value of 2.99. The mean scores of Lactic Acid Bacteria to Reduce Microorganisms, Lactic Acid Cultures, and Lactic Acid Bacteria were significantly lower than the control and thus labeled unacceptable as labeling options.

The mean scores for Lactic Acid Bacteria to Reduce Harmful Microorganisms, Lactic Acid Cultures to Reduce Harmful Microorganisms, and Lactic Acid Bacteria to Reduce Food-borne Pathogens were not determined to be significantly different than the control mean score and therefore were labeled as acceptable labeling methods for lactic acid bacteria inclusion in ground beef.

Objective Three
To determine the impact of educational material on consumer perception of ground beef, a one-way ANOVA was conducted on the perceptional differences of ground beef additives by consumers. In Table 5, ANOVA was significant, F (1,144) = 5.204, p = .02.

Table 5
ANOVA analysis of ground beef additive based on additional education.

Source	*SS*	*df*	*MS*	*F*	*p*
Lactic Acid Cultures					
Between Groups	5.760	1	5.760	5.204	.02
Within Groups	159.397	144	1.107		
Total	165.158	145			

In Table 6, the means of 17 beef ingredients for the non-experimental group was calculated and measured against the means of the experimental group. There were no significant differences in the beef ingredients means, except for one, lactic acid cultures. Lactic acid cultures reported a mean of 2.21, a standard deviation of 1.067. When compared to the experimental group (M = 2.60, SD = 1.307), there was a .49 increase in positive perception of this ingredient.

Table 6
Beef Ingredients of Experimental Group versus Non-Experimental Group (N = 155)

Source	*M*	*SD*
Without Experiment		
Lactic Acid Cultures	2.21	1.067
With Experiment		
Lactic Acid Cultures	2.60	1.307

Conclusions

The first objective was to determine the demographics and buying habits of ground beef consumers. According to the reported data, consumers that are buying ground beef products are generally white females with some college or a college degree. Given the findings, a majority (76.1%) of ground beef consumers are most concerned with the freshness of their ground beef and least concerned about the ingredients that go into their beef product. However, 58% of consumers reported that they sometimes or often read the products' labels. It can be concluded that the main item that consumers are looking for on packaged ground beef is for the freshness date. An overwhelming majority (89.1%) reported that they eat ground beef on a weekly to daily basis.

For objective two, the researchers found that consumers reported that the most agreeable statement out of the USDA approved statements was "Lactic Acid Bacteria to Reduce Harmful Microorganisms." When compared with the control, "plain beef label", there was no significance found that would suggest that consumers would prefer one label over another. In addition, two more statements were determined to not be statistically different than the control of mean of 2.99.

Objective three sought to determine how promotion of lactic acid cultures would affect consumers' perceptions of acceptability about ground beef products and cause them to rate that additive lower than the other. The second part of objective three looked at the influence of educational cards given to every other consumer as they filled out the survey. There was a significant increase in acceptability between those with no educational card (M = 2.21) and those with an educational card (M = 2.60).

Rogers (2000) suggests that knowledge will affect decision making which was validated in this limited experimental research. Consumers who were educated about Lactic Acid bacteria previous to reading the label were significantly more accepting of the item on the ground beef label than those who were not provided the educational card. This indicates that an additional educational label on the ground beef label could improve consumer acceptance.

Recommendations

The researchers recommend that the results of this preliminary research not be inferred to populations outside the single geographical region where the data was collected, however, the ultimate goal of this research line is to determine national perspectives. It is suggested that this research be replicated using a national stratified sample of socio-economically diverse regions in order to allow the researchers to infer the results to the general population. This research will assist in determining consumer perceptions of ground beef labeling issues and buying habits of consumers of ground beef. Instrumentation should be evaluated and improved where opportunities allow.

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Adding Value to Professional Conferences for Graduate Students

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Abstract

Graduate students are a critical component to the agricultural education profession and it is necessary to ensure that conferences provide valuable professional development to its future leaders. The purpose of this descriptive research was to assess Agricultural Education graduate students' perceptions and to determine the factors influencing attendance at AAAE conferences. Sixty-six graduate students responded to a national online survey in the fall of 2009 for a 55% response rate. Results of this study indicated networking and employment opportunities were the most important reasons why graduate students attend professional conferences. The majority of graduate students attending conferences were PhD/EdD students pursuing higher education faculty positions. Research paper sessions and professional development workshops were the two highest rated conference activities, while the graduate student meetings and special interest group were ranked the lowest. Qualitative comments indicated the need for additional networking opportunities and more structured needs-based graduate student meetings. These findings offer useful information for AAAE faculty coordinators to plan valuable graduate sessions, programs, and activities at future conferences.

Introduction/Literature Review/Conceptual Framework

Within the American Association for Agricultural Education (AAAE), members value the importance of professional development, as evidenced by annual conferences within the three regions of the organization, as well as the national conference. A cursory review of conference agendas and conference business meeting minutes revealed that an overwhelming majority of AAAE members attended at least one of the AAAE-sponsored conferences for each of the past several years. Such anecdotal evidence was indicative of the value AAAE members placed on professional development and research-sharing opportunities provided through the various conferences of the organization.

Interestingly, a review of the research paper proceedings and poster presentations for the North-Central, Southern and Western regions as well as the National research conference proceedings revealed numerous authors/presenters were not faculty members, but graduate students. Few would question the value of involving graduate students in these research and innovative-idea sharing opportunities. However, there was a question as to the professional development value of regional and national AAAE conferences, beyond the research and poster sessions, for the graduate students.

VanSandt and Anderson (1992) noted professional conferences provided both personal and professional growth opportunities. "Through meeting new people, you create opportunities for your own growth and build a network of resource people and a support system" (2). Aitkin, Novak, Characklis, Jones and Vieksland (2004) listed benefits of professional organization conferences, including sense of identity, recruitment, personal and career development, networking, formal and informal information exchange, and research, teaching and practice connections.

The meeting participation model (Lee and Back, 2008) hinges on the concept that association members make meeting participation decisions consciously, therefore "their plan to attend the meeting can be affected or altered through changes in attitude and perceived social norms that contribute to the formation of meeting participation intention" (p. 308). The meeting participation model included five constructs: attitude, subjective norm, perceived behavioral control, destination image, and past experience. Lee and Back (2008) recommended utilizing strategies to encourage first-time members' attendance as well as to focus on the benefits the sponsoring organizations or individuals receive through allowing meeting attendance.

Knight (2002) noted the importance of formal and informal student interactions at conferences, whereby students have the opportunity to share together and discuss with one another what they have gleaned from conference sessions. Additionally, Knight noted the students had opportunities to meet future professional colleagues. Apul and Tufenkji (2007) reported graduate students desired access to regional and national conferences for similar reasons to Aitkin, et al; networking, real-world experience, targeted membership and organizational service. Further, conferences were listed as one of the key reasons graduate students would join a professional organization. Perhaps most interesting was the Apul and Tufenkji finding that graduate students perceived networking as not only interacting professionally with professionals and faculty members, but also connecting with other students.

The American Society of Horticultural Sciences provided a workshop for graduate and undergraduate students attending the 2008 ASHS professional conference. The pre-conference workshop, facilitated by an ASHS member, targeted undergraduate and graduate students with information about the various components of the conference in order that the students could "gain the most from their conference experience" (ASHS, 2008, p. 1054). An additional student-oriented workshop during the annual ASHS conference sponsored by the ASHS Collegiate Activities Committee was entitled *Student Career Forum: Options, Q & A, …*, with the objective "to expose students to some of the career options in horticulture and provide a forum for students to ask questions and get answers from a panel of professionals in horticulture" (p. 1061).

Barrick, Clark and Blaschek (2006) discovered faculty and graduate student agreement on the importance of faculty members providing opportunities for graduate students to attend professional meetings. However, the data revealed graduate students perceived the faculty members should be more proactive in providing those professional development opportunities. Additionally, Barrick et al. reported graduate students believed their ideas were not treated with due respect by faculty mentors and graduate students preferred to receive more assistance in preparing publications.

Other researchers acknowledged the importance of helping graduate students develop research skills (House & Sterns, 2003; Shelton, Ahern, Piirto & England, 2006). Likewise, the importance of preparing graduate students outside classroom settings was noted by McKenna, Reed, Fulcher and Mankolo (1993) and, Skelly, Kohlleppel, Kane and Bradley (2002). However, the focus was primarily on field and laboratory operations rather than professional development and peer contact. Mentoring was noted as essential in the faculty member-graduate student relationship (Dodson, Fernyhough, & Holman 2006; Shelton et al., 2006; Kilmer, Hoover, & Connor, 1997), however none included professional conferences as part of the mentorship process. Based on the involvement of master's and doctoral level graduate students in regional and national Agricultural Education professional conferences, the importance of such involvement for the professional and career development of the students was accepted. However, there was little evidence regarding the best practices for accomplishing that professional development and career mentoring.

Purpose and Objectives

The purpose of this research was to assess Agricultural Education graduate students' perceptions and to determine the factors influencing attendance at AAAE regional and national conferences. This purpose was accomplished through the specific objectives:

1. Determine selected demographic characteristics of graduate students who attended the AAAE regional and national conferences in 2008-2009;
2. Determine the graduate student attendees perceptions of professional development activities at AAAE regional and national conferences in 2008-2009;
3. Determine graduate students attendance patterns at AAAE regional and national conference in 2008-2009
4. Determine participants' perceptions of graduate student meetings at AAAE regional and national conferences in 2008-2009

Methods and Procedures

Methodology

The population for this study was graduate students who attended a regional and/or national agricultural education affiliated professional conference in 2008-2009. A census of 127 participants was obtained from the official list of attendees provided by each regional conference chair and the national chair. Due to inaccurate and incomplete lists, the final sample consisted of 120 graduate students. The instrument was researcher-developed based upon needs and curiosities of agricultural education faculty and graduate students at Montana State University. The instrument was designed on Survey Monkey™ with specific focus on how to add value to professional conference participation for graduate students. Questions were derived from literature on conference participation and student professional development (VanZandt & Andersen, 1992; American Society for Horticultural Science, 2008; Skelly et al., 2002). Survey questions were created to determine attendance patterns at AAAE conferences, opinions on the conference sessions and activities, factors that added or decreased value to conference experiences, and gain insight into professional development opportunities. The survey was assessed for validity by a panel of university faculty. Ten agricultural education graduate students who had not attended an AAAE conference participated in a pilot test to assess reliability. A Cronbach's alpha was also calculated on the instrument and revealed a reliability coefficient of 0.81. Following the validity and reliability assessments, several questions were restructured.

Data Collection
The survey was disseminated using the web-based host Survey Monkey™ and consisted of 25 questions divided into four sections. Section one centered on participants' graduate program background and sought to determine their participation levels in professional conferences. Sections two and three included specific questions about participation in a 2008-2009 AAAE Regional Conference and/or the 2009 AAAE National Conference. These two sections assessed respondents' perceptions of the value of conference sessions and activities. The last section focused on participants' insight into ideas for future conferences. Researchers utilized a modified version of Dillman's (2000) tailored design method. An introductory e-mail was sent via Survey Monkey™ to 120 graduate students who met the criteria of having attended a regional and/or national AAAE conference in 2008-2009. This correspondence informed potential participants they had been selected for the study and included background information about the study, the informed consent form, and a web link to the survey. Participants gave voluntary consent by clicking on the link to complete the survey. One university blocked emails from Survey Monkey™ , therefore a copy of the email was sent through a personal email and responses were combined in the results section. The survey remained active for 30 days and non-responders/late responders were sent two reminder emails two weeks apart. Because the response rate was less than 80%, researchers chose to contact 5 to 10% of the sample to gather data to address the non-response as recommended by Tuckman (1999). A random sample of 10 non-respondents was contacted via personal email to answer critical questions on the survey. After comparing answers, no differences were found between respondents and non-respondents in a way relevant to the study.

Data Analysis
Data were analyzed using SPSS 18.0 software package, Microsoft Excel, and Survey Monkey™. The data collection period was from September 22, 2009 to October 22, 2009. Responses were filtered through Survey Monkey™ to only include current graduate students during the 2008-2009 school year and fully completed surveys. After eliminating duplicates and partial responses, the survey yielded a 55.0% (N=66) response rate. Survey Monkey™ allowed the researchers to report descriptive statistics by providing charts and graphs based on each question. For further analysis, data were downloaded into Microsoft Excel and SPSS to calculate means, standard deviations, and reliability coefficients.

Findings

Objective 1: Determine selected demographic characteristics of graduate students who attended the AAAE regional and national conferences in 2008-2009
Based on registration lists obtained from regional and national conference coordinators, 120 graduate students comprised the study sample. All respondents were enrolled as graduate students during a semester or quarter of the 2008-2009 school year. Twenty-eight percent of the respondents (n=19) were Master's students; 63.6% (n=42) were PhD/EdD students; and 7.6% (n=5) were in combined Master's and Doctorate programs.

The suggested length of participants' graduate programs was reported as 1-2 years by 27.3% of respondents (n=18); 2-3 years by 25.8% (n=17); 3-4 years by 40.9% (n=27); 4-5 years by 4.5% (n=3); and more than 5 years by 1.5% (n=1). When asked about the number of semesters completed in graduate school, 18.2% (n=12) completed 1-2 semesters; 40.9% (n=27) completed 3-4 semesters; 15.1% (n=10) completed 5-6 semesters; 9.1% (n=6) completed more than 6 semesters; and 16.7% (n=11) had completed all degree requirements.

Participants were asked to identify their career goals and research topic areas. The career goals reported were as follows: 19.7% (n=13) were pursuing extension, 16.7% (n=11) were pursuing high school teacher or administrator; 16.7% (n=11) were pursuing industry positions; 12.1% (n=8) were pursuing non-profit work; 15.2% (n=10) were pursuing government; 15.2% (n=10) were pursuing PhD/EdD programs; 72.7% (n=48) were pursuing higher education faculty; and 15.2% (n=10) were pursuing international development. Respondents were asked to categorize their research topic into one of the National Research Priority Areas (Table 1).

Table 1
Graduate Student Research Topic Areas According to National Research Priority Agenda (N=66)

Topic	*f*	%
Agricultural Education in University and Postsecondary Settings	16	24.2
Agricultural Education in Schools	13	19.7
Agricultural Communications	12	18.2
Agricultural Education in Dom. & Int. Settings: Extension and Outreach	10	15.2
Agricultural Leadership	9	13.6
Other	4	6.1
Undecided	2	3.0

Objective 2: Determine the graduate student attendees perceptions of professional development activities at AAAE regional and national conferences in 2008-2009

Participants were asked to rate the usefulness of regional conference activities to professional development using a 5-point Likert-type scale (Table 2). Means and standard deviations were

Table 2
Usefulness of Regional Conference Activities to Graduate Student Professional Development (N=51)

Conference Activity	1		2		3		4		5			
	f	%	*f*	%	*f*	%	*f*	%	*f*	%	Mean	SD
Research Paper Sessions	0	0	1	2.0	10	19.6	20	39.2	19	37.4	4.14	0.81
Prof. Dev. Workshops	0	0	4	7.8	7	13.7	11	21.6	9	21.6	3.81	1.01
Arranged Social Events	1	2.0	4	7.8	11	21.6	20	39.2	10	19.6	3.80	0.89
Arranged Local Tours	1	2.0	2	3.9	6	11.8	16	31.4	7	13.7	3.80	0.97
Professional Seminars	0	0	4	7.8	10	19.6	13	25.5	9	17.6	3.75	0.97
Poster Session	0	0	4	7.8	17	33.3	23	45.1	3	5.9	3.53	0.75
General Session	0	0	6	11.8	17	33.3	16	31.4	7	13.7	3.47	0.97
Graduate Student Meeting	0	0	10	19.6	4	7.8	12	23.5	6	11.8	3.44	1.13
Business Meeting	3	5.9	5	9.8	19	37.3	11	21.6	2	3.9	3.10	0.96

Note. On a 5-point Likert-type scale, 1=Not useful, 2=Somewhat useful, 3=Useful, 4=Very Useful, 5=Extremely Useful calculated. Only 51 respondents answered this question because 15 did not attend a regional conference. If respondents did not attend the conference activity or if the activity was not offered, they were not included in the final calculations.

Participants were asked to rate the usefulness of national conference activities to professional development using a 5-point Likert-type scale (Table 3). Means and standard deviations were calculated. Only 35 respondents answered this question because 31 did not attend the national conference. If participants did not attend the conference activity, they were not included in the final calculations.

Table 3
Usefulness of National Conference Activities to Graduate Student Professional Development (N=35)

Conference Activity	1		2		3		4		5			
	f	%	*f*	%	*f*	%	*f*	%	*f*	%	Mean	SD
Research Paper Sessions	0	0	1	2.9	2	5.7	13	37.1	18	51.4	4.41	0.74
Prof. Dev. Workshops	0	0	0	0	6	17.1	8	22.9	17	48.6	4.35	0.80
Alumni Events	1	2.9	1	2.9	3	8.6	11	31.4	10	28.6	4.08	1.02
Professional Seminars	0	0	2	5.7	4	11.4	11	31.4	6	17.1	3.91	0.90
Arranged Social Events	0	0	2	5.7	5	14.3	19	54.3	5	14.3	3.87	0.76
Committee/SIG/Bus. Mtg	0	0	1	2.9	9	25.7	13	37.1	7	20.0	3.87	0.82
Poster Session	0	0	3	8.6	5	14.3	22	62.9	3	8.6	3.76	0.75
Opening Session	0	0	5	14.3	8	22.9	9	25.7	9	25.7	3.71	1.07
Graduate Student Meeting	1	2.9	5	14.3	10	28.6	5	14.3	2	5.7	3.09	0.97

Note. On a 5-point Likert-type scale, 1=Not useful, 2=Somewhat useful, 3=Useful, 4=Very Useful, 5=Extremely Useful

Objective 3: Determine graduate students attendance patterns at AAAE regional and national conference in 2008-2009

Of the 66 total respondents, 34 (54%) were affiliated with the Southern Region, 18 (28.6%) were affiliated with the North Central Region, and 11 (17.5%) were affiliated with the Western Region. Forty-three respondents (65.1%) reported to have attended one or two AAAE conferences, while 33 respondents (39.3%) had attended 3-5+ conferences. When asked about attendance at all professional conferences (AAAE and others), 22 respondents (34.9%) have attended more than five, 31 respondents (49.1%) have attended two to four, and 10 respondents (15.8%) have attended either one or five. In a check-all-that-apply format, participants were asked the types of all professional conferences attended (Table 4).

Table 4
Professional Conferences Attended by Graduate Students (N=66)

Conference	*f*	%
American Association of Agricultural Education (AAAE)	62	98.4
Other	24	38.1
North American College and Teachers of Agriculture (NACTA)	19	30.2
Association for Career and Technical Education (ACTE)	11	17.5
Association for International Agricultural and Extension Education (AIAEE)	8	12.7
Association for Communication Excellence (ACE)	8	12.7
Agricultural Communicators of Tomorrow (ACT)	7	11.1
Association of Leadership Educators (ALE)	6	9.5

*Other included State AgEd Conferences, NAAE, SAAS, NAE 4-HA, ASABE, NIFS, ATE, MANRRS, AMS, Outreach Scholarship Conference

Fifty-one (81.0%) of the respondents attended a Regional AAAE conference in 2008-2009. In a mark all that apply format, participants marked the reasons for attending the regional conference (Table 5).

Table 5
Graduate Students' Reasons for Attendance at Regional Conferences (N=51)

Categories	*f*	%
Professional Networking	37	72.5
To learn about research	27	52.9
To present a poster	27	52.9
To present a paper	25	49.0
Non-professional reasons*	14	27.5
Other	3	5.9
Class requirement	1	2.0

*Non-professional reasons included to visit friends, see a new town, location, etc…

Attendance for professional conferences was supported by a combination of the following funds listed in descending order: the department (82.4%), personally (58.8%), grants (15.7%), university (11.8%), college (9.8%), and other (9.8%).

Objective 4: Determine participants' perceptions of graduate student meetings at AAAE regional and national conferences in 2008-2009

Twenty-nine respondents (56.9%) indicated their regional conference had a specific time for a graduate student meeting, and 70.6% of these (n=24) attended this meeting. When asked to categorize the meeting, 23 respondents (85.2%) described it as a meet and greet/social; 11 respondents (40.7%) had guest speakers at the meeting; four respondents (14.8%) described it as professional development; three respondents (11.1%) described it as other; and one respondent (3.7%) described it as service learning.

Thirty-five (55.6%) respondents attended the National AAAE conference in 2008-2009 while 28 did not. Of these 35 participants, 21 (60.0%) attended the graduate student meeting. In a forced choice question format, participants ranked the importance of graduate student meeting activities on a 6-point Likert-type scale (Table 6).

Table 6

Importance of Graduate Student Meeting Activities at National AAAE Conference (N=35)

Conference Activity	1		2		3		4		5		6			
	f	%	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%	Mean	SD
Networking	3	5.7	4	7.5	4	7.5	11	20.8	16	30.2	15	28.3	4.47	1.46
Employment Opp.	8	14.3	5	8.9	6	10.7	9	16.1	14	25.0	14	25.0	4.04	1.75
Research Assistance	3	5.9	7	13.7	16	31.4	9	17.6	7	13.7	9	17.6	3.73	1.48
Prof. Skill Devlpmt.	3	5.4	12	21.4	11	19.6	15	26.8	8	14.3	7	12.5	3.61	1.44
Educ. Seminars	4	7.5	16	30.2	12	22.6	6	11.3	10	18.9	5	9.4	3.32	1.50
Grad. Student SIG	29	46.8	8	12.9	6	9.7	7	11.3	7	11.3	5	8.1	2.52	1.76

Note. On a 6-point Likert-type scale, 1=Not important, 2=Somewhat important, 3=Important, 4=Moderately Important, 5=Very Important, 6=Extremely Important

When asked about how graduate student meetings should be structured at future conferences, participants ranked the following choices in descending order: 59% (n=36) desired a meet and greet at the beginning of the conference; 58.3% (n=35) desired various sessions throughout the conference; 56.7% (n=34) desired a graduate session during a business meeting; and 55.2% (n=32) desired all graduate students to sit together during a meal. Additionally, 69.8% of the respondents (n=44) also indicated they would like to have one to two graduate student activities during a professional conference.

In a short answer format, participants were asked how graduate student meetings could be improved at professional conferences. Comments from 26 respondents were summarized into three themes: (1) Adding more structure and content to graduate student meetings by having a formal agenda, leadership, planned program activities, and useful information to take home; (2) Focus the meeting on needs-based topics to improve professional development, research, and teaching skills in order to better prepare students for future careers; and, (3) Provide additional formal and informal networking opportunities for graduate students to interact with each other and faculty members.

Table 7
Participants' Ideas for Improving Graduate Student Meetings at Conferences (N=26)

Themes
More structure and content
"Have more than one graduate student meeting"
"Better promotion and organization of graduate student meetings prior to conference
"Have presentations, handouts and take home materials that may help grad students when they go back home"
"Have a designated student leader to serve as a point person for students"
"Provide more structured events, meetings, and activities led by faculty member or experienced graduate student"
"Make them more than a meet and greet. Add some substance to the program and make it meaningful to be there"
"Have a formal agenda for graduate student meetings. A well-thought out program would allow students to receive proper benefit after leveraging time to attend"
Needs-based meeting topics
"Survey the graduate students to determine interests"
"Create a meaningful program"
"Have a specific professional development session for graduate students"
"Keep sessions for graduate students with an objective to improve their professional skills and research skills for the future when they will work as faculty or educators"
"Provide incentives with unique opportunities for attendance and be creative with rewards"
"Sending out questionnaires like this one to see what are the needs of graduate students"
"Give graduate students something useful to walk away with. Something unique that they can't get at their home campus"
Provide additional networking opportunities
"Create a more accepting atmosphere of graduate students that encourages interaction"
"Have more organized social activities"
"Allow more time for graduate student interaction. The current meetings are rushed and there is little time to converse"
"I would also like to see activities that allow graduate students and professionals to meet and greet/network; I would also like to see more focus on pairing students with professionals in a mentoring relationship for added assistance"
"Schedule small get-together activities. The "parking lot" conversations have been most beneficial"
"Make the meetings more informal"
"Encourage all regions to include graduate student meetings as a time to network and socialize"

Conclusions/Implications/Recommendations

Professional networking was considered the most important reason why graduate students attend professional conferences confirming the research of VanSandt and Anderson (1992). Graduate students placed repeated emphasis on this factor throughout the survey. Although students can participate in scheduled conference activities, it is also important that they have time to visit informally with faculty during the conference. Faculty should acknowledge the significance placed on developing personal and professional relationships and strive to frequently interact with graduate students in different ways. This interaction can be done formally in conference sessions, meetings, workshops, and panel discussions, as well as informally at social activities, tours, and session breaks. These opportunities allow for information exchange and assist in building relationships that can benefit both faculty and students in the future. Conference coordinators should consider including these types of events in the schedule in order to provide both formal and informal networking opportunities.

Beyond networking, other closely ranked reasons to attend conferences were to learn about research and present a paper or poster. These findings reinforce the value of graduate student involvement at the conference beyond attendance. These unique opportunities help to build confidence, improve research skills, create a sense of identity, establish professional connections, and enhance the overall graduate program experience (Aitkin et al., 2004).

The majority (63.6%) of graduate students attending conferences were PhD/EdD students, and when asked about career goals, 72.7% indicated that they were pursuing higher education faculty positions. With this high number of doctoral students pursuing professional positions, it is critical that conference coordinators allow time for graduate students to visit with faculty about career opportunities; this time also offers an excellent opportunity for faculty recruitment (Aitkin et al., 2004). Additionally, the inclusion of a career workshop, similar to the 2008 American Society of Horticultural Sciences conference, that exposes students to professional options and allows them to ask faculty questions could be a valuable experience.
All participants rated the same top two conference activities as being very to extremely useful for professional development. The highest rated activities were research paper sessions and professional development workshops. Therefore, graduate students should continue to be encouraged by advisors to submit and present papers at conferences in order to gain experience and establish their professional identity. Professional development workshops should also incorporate topics valuable to both faculty and graduate students and possibly be divided into two separate sessions. It might be useful for faculty to submit separate professional development workshop proposals so that the sessions can meet the specific needs of each audience. The lowest rated activity at regional conferences was the business meeting and ranked by over half of the respondents as the desired time to offer a graduate session. These results indicate this could be an appropriate time to offer a professional development session specifically for graduate students.

At the national conference, the graduate student meeting was the lowest ranked activity, while 59.7% of respondents also rated the graduate student special interest group as least important. This data indicates the need to re-examine the quality and focus of these graduate student events. If conference coordinators are to provide valuable career and professional development for graduate students, then faculty must reconsider the needs of graduate students at professional conferences and structure activities to better educate its future leaders. Further research on the professional and career development needs of graduate students can assist in providing a direction for coordinators as they plan regional and national conference agendas.

Qualitative comments indicated the need for more structured and topic-based graduate student meetings. The development of a student leadership team that provides direction to the overall graduate program could be a used to plan meeting content, events, and networking opportunities each year. The idea of creating a newsletter might also be an additional opportunity for students to contribute to the organization and collaborate with faculty. This graduate leadership structure has been successful in other organizations, such as the Association of International Agricultural and Extension Education, and should be considered for AAAE members as well. Over 50% of the respondents stated that they would like to have a meet and greet, multiple sessions, a graduate session during a business meeting, and a meal when all graduate students sit together. Coordinators should include these kinds of events in the schedule to maximize the value of the conference for graduate students. A separate evaluation for graduate student attendees should be conducted at the end of conferences to evaluate the success and value of these activities.

The results of this graduate student study corroborated the meeting participation model (Lee and Back, 2008), most especially the constructs of attitude, perceived behavioral control, and destination image. Networking and employment opportunities were ranked as the most important activities at the national conference; therefore additional focus should be placed on how to improve these targeted areas. As mentioned, formal and informal opportunities to network and socialize should be incorporated into the agenda. The establishment of structured graduate student meetings as well as informal social events can assist in providing the time for this desired interaction. The creation of a faculty- student or student-student mentoring program might also encourage relationship building important for future employment. Mentoring programs can provide an essential link to prepare graduate students for the agricultural education profession and its future leadership. All conferences offer a unique outlet for interactions between faculty and graduate students and should continually be re-assessed to determine how to improve the experience for attendees. As Apul and Tufenkji (2007) reported, graduate students attend conferences to network and gain real-world experiences; therefore, it is the responsibility of the organizational members to create these valuable opportunities for participants.

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Organizational Climate of the American Association for Agricultural Education

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Abstract

Monitoring and evaluation of programs and outcomes is common practice in educational arenas; not so frequent within professional societies and organizations. A clear understanding of the climate of an organization is important; potentially providing leadership with an understanding of how to improve the functionality of an organization. The purpose of this study was to describe how individual members of the American Association for Agricultural Education (AAAE) perceived working together and to describe the level of support given by the profession to the 2007-2010 version of the National Research Agenda (NRA). Overall, AAAE members varied greatly. However, most members agreed to some extent that the AAAE organization allowed members to be involved in the sharing of ideas and information in a nonthreatening, supportive environment. Additionally, most members indicated that within the organization there was an expectation and support of new ideas and practices. Results indicated AAAE members had mixed beliefs regarding the collective accountability for excellence in performance of shared outcomes within the organization. The NRA priorities are well-understood, useful, and worthwhile to a majority of the membership. The data suggest that the average member felt that others in the profession were less supportive than they were about the NRA priorities.

Introduction and Literature Review

Basic organizational principles suggest that the effectiveness and efficiency of any group or organization requires frequent and continuous monitoring for the greatest impact (Senge, 2006). Monitoring and evaluation of programs and outcomes is common practice in educational arenas; not so frequent within professional societies and organizations. By definition, professional organizations are groups of people working together to accomplish a set of goals and objectives that serve the profession. The American Association for Agricultural Education (AAAE) is such an organization.

In recent years, several changes have been implemented seeking to advance desired outcomes. One such change was the development and adoption of the *National Research Agenda of Agricultural Education and Communication* (NRA; Osborne, 2007). The NRA was created in response to a need for prioritizing research areas to create opportunities for securing research funding from numerous state and national agencies. The NRA was the first national research agenda to be developed and formally embraced by the broader discipline of agricultural education and communication. The NRA is organized into five broad disciplinary dimensions: agricultural communications, agricultural leadership, Extension and outreach education, agricultural education in university and postsecondary settings, and school-based agricultural education (Osborne).

University faculty members build relationships and develop professionally through voluntary membership in professional associations. As dues-paying members, the level of participation and the acquired benefits are controlled by the individual through the formalized agreement (Gruen, Summers, & Acito, 2000). Because membership in these associations is voluntary, it is important for the members to be involved in organizational knowledge and socialization. "Comprehension of the organization's goals and values help link the membership to the mission as a whole" (Gruen et al., p. 39). Research in organizational behavior posits that organizational knowledge has a positive effect because members understand how the organization affects the industry and increases members' comfort and competence in their roles.

Change is subject to organizational climate and culture. The shared beliefs and perceptions of an organization define its climate. Organizational climate is a feeling by the members; how they perceive something should be done at that moment. The climate of the organization is developed through the commonly accepted policies, practices, and procedures (Anderson & West, 1998). Climate differs from organizational culture. In contrast, culture is the deeply rooted nature of the organization as a result of long-held formal and informal structures, expectations, and traditions. Culture is created through an evolution of a system, with its research presenting detailed description and analysis of the social structure in a holistic manner (Denison, 1996). Whereas the climate of an organization can be relatively easy to change, change in culture takes the full commitment of every leader within the organization for a sustained period of time (Hofstede, 1997).

According to Loo (2003), three conditions must be present for a shared climate to exist: "individuals must interact, must have some common goal which predisposes individuals toward collective action, and sufficient task interdependence" (p. 512). Academic associations meet these criteria on many levels: department, university, region, and national affiliations. Members interact within and outside of their respective departments and universities. The common affiliation with the association is based on interest in a common goal, and potentially, collective action. Finally, the common interest and affiliation create an interdependence that yields a shared understanding.

Theoretical and Conceptual Framework

Social Exchange Theory (SET; Cropanzano & Mitchell, 2005) served as the theoretical framework for this study. SET is considered to be "among the most influential conceptual paradigms for understanding workplace behavior" (p. 874). SET can be used to explain the interactions of people that lead to commitments and relationships. The defining characteristics of SET are interdependence and reciprocity. Interdependence is created when two or more people work toward a common goal, such as priorities in an organization. This interaction results in a reciprocal relationship of give-and-take; for example a faculty member pays dues to an association and in exchange expects a scholarly journals and access to member-only events. The reciprocal exchange does not have to be of equal perceived or economic value. It is valuable to assess the shared organizational climate through the interaction of members and specific organizational goals.

Understanding the climate of a team or organization can provide leadership with a better picture of how a team is operating. Based on that knowledge, changes can be in implemented to improve functionality of the team or organization. However, clearly identifying the climate and its influences on an organization can be difficult. For the purposes of this study, the Team Climate Inventory (TCI; Anderson & West, 1996) provided a conceptual framework for measuring organizational climate.

The TCI is a multidimensional measure of work climate inventory based on four factors identified by West (1990): Vision, participative safety, task orientation, and support for innovation. Vision is the valued outcome that can serve as a motivating factor. Participative safety represents the ability of group members to be involved in the sharing of ideas and information in a nonthreatening, supportive environment. Task orientation is the collective accountability for excellence in performance of shared outcomes. Finally, support for innovation is expressed through the expectation and support of new ideas and practices.

The TCI is a useful diagnostic tool to identify team development. For example, a low team climate score in one factor, such as task orientation, would provide an organization with the opportunity to seek additional information about quality measures and shared information between group members. Denison (1996) identified quantitative research methods as the best measurement of organization climate because "generalization across social settings not only was warranted but was also the primary objective of the research" (p. 621). Climate research emphasizes the impact of organizational systems on members and organizations rather than social evolution. Researchers must assess member perceptions of organizational goals, vision, and practices in order to draw conclusions about an organization's climate.

As an organization, the AAAE serves educators, communicators, and leaders in agriculture through research and application of its principles. Three goals of the organization "(a) provide an approach to identifying, prioritizing, and organizing research in teaching and learning; (b) provide opportunities for collaboration within and outside of agricultural education; and (c) provide opportunities for individual and organizational growth, development, and renewal" (AAAE, 2010, ¶ 2). Its active members create a formal agreement, through the payment of dues, for access to a scholarly journal, voting rights, committee and leadership participation, regional and national conference participation, and listserv messages.

In 2007 the AAAE entered into a formal agreement with its membership with the publication of a national research agenda (Osborne). The *National Research Agenda* of Agricultural Education and Communication (Osborne) was developed to coordinate the research efforts within agricultural education. Osborne proposed that the NRA was

> … the first national research agenda to be developed and formally embraced by the broader discipline of agricultural education and communication. Members of the profession have long recognized the value of such a document for effectively communicating research priorities to numerous state and national interests… (p. 2).

Furthermore, the *National Research Agenda* of the AAAE is intended to serve as a document that is to:

- convey the research priorities of the AAAE to various stakeholders,

- provide focus toward the most pressing issues facing the discipline,
- facilitate coordination of research efforts between research parties, and
- enhance the perception of the profession as a whole (Doerfert, 2009, p. 1).

The NRA specifically addresses one of the organizational goals: to identify, prioritize, and organize research. As the expiration date of the NRA approaches, it is important that the organization determine the members' perceptions of this agreement, and assess the organizational climate.

Purpose and Research Objectives

A clear understanding of the climate of an organization is important; potentially providing leadership with an understanding of how to improve the functionality of an organization. Furthermore, the inaugural edition of the *National Research Agenda* is set to expire in 2010. Hence, the need to determine the climate of the AAAE membership and the acceptance of the *National Research Agenda* is apparent and timely. Therefore, the purpose of this study was to describe how the AAAE membership perceives working together, and to describe the perceived level of support given by the profession to the 2007-2010 edition of the NRA. The study was guided by the three research objectives:

1. Describe selected professional characteristics—academic position, Research Priority Area focus, regional affiliation, AAAE membership status, frequency of attendance at regional and national AAAE meetings—of AAAE members.
2. Describe members' perceptions of the organizational climate of the AAAE.
3. Describe the level of the profession's support for the2007-2010 edition of the *National Research Agenda*.

Procedures

Population

As part of a larger study, the research design of this quantitative study was descriptive in nature. In the fall of 2009, the on-line *Directory of the American Association for Agricultural Education* included a total of 593 faculty, student, or associate members at the time that the Directory was accessed; of which, 317 were noted as dues paying members who were considered the population for this study. A census of dues paying AAAE members (N = 317) was taken to more accurately describe the characteristics of the population and eliminate potential errors associated with subject selection and sampling.

Instrumentation

A four-section electronic data collection instrument was researcher developed by modifying the Team Climate Inventory (TCI) developed by Anderson and West (1996). The modifications to the design and format of the data collection instrument were guided by Dillman's (2007) suggestions using Web-hosted software provided by Hosted Survey™. In the first three sections, subjects were asked to respond to 45 statements or questions using a 5-point Likert-type scale to reflect levels of agreement. The first section consisted of 24 statements representing communication and innovation behaviors within the AAAE. The second section consisted of 13 questions regarding the objectives of the AAAE and the National Research Agenda. The third section consisted of eight questions related to the task style of members of the AAAE. The fourth section sought to identify subjects' characteristics: academic position, research priority area focus, regional affiliation, AAAE membership status, length of membership in AAAE, frequency of attendance at regional and national AAAE meetings, and length of employment.

Face validity of the data collection instrument was determined by a panel of eight experts; all of whom are considered experts in the areas of agricultural education, instrument development, and research methodology. Construct validity were determined in several previous studies (Anderson, Hardy, & West, 1990; Anderson & West, 1996, 1998; Loo & Loewen, 2002; Mathison, Einarsen, Jorstad, & Bronnick, 2004; West & Farr, 1989) through exploratory and confirmatory factor analysis. Development of constructs and testing of construct validity of the TCI were outlined by West and Anderson (1996), who reported a series of studies (Anderson, et al.; West & Anderson, 1992; West & Farr) that began in 1989 and resulted in the commercial TCI data collection instrument published by Assessment Services for Employment in 1996. Because the items used in this study were based upon the items and constructs previously determined to be valid, the constructs were considered valid.

Reliability of the instrument was previously reported in a series of studies (Anderson, et al., 1990; West & Anderson, 1992; West & Farr, 1989) and outlined by West and Anderson (1996), who reported Cronbach's alpha coefficients for the five constructs—participative safety, support for innovation, vision, task orientation, social desirability—that ranged from .64 to .95 (N = 717). None of the previous studies were conducted in the United States or used a population that was reasonably comparable to the AAAE. Furthermore, the data collection instrument used in previous studies contained several sources of measurement error (e.g., multiple-component or *double-barreled* items), which required expanding the instrument to 51 single-component competencies. Therefore, a pilot test was conducted to estimate the reliability of the modified instrument. Members of an agricultural education department at a Land-Grant University served as the pilot study sample. The sample included individuals engaged in teaching and research in each of the research priority areas (N = 30). To minimize testing bias during the pilot study, all references in the data collection instrument referring the AAAE were changed to the department, and references made to the National Research Agenda were changed to departmental goals and objectives.

Cronbach's alpha coefficients were calculated for the five scales (West & Anderson, 1998)—participative safety, support for innovation, vision, task orientation, and social desirability—yielding coefficient estimates of reliability of .88, .90, .87, .84, and .51 respectively (N = 30). Due to the low reliability estimate associated with social desirability, all items associated with that construct were eliminated from the questionnaire. This reduced the total number of items from 51 to 45, and yielded an overall reliability coefficient for the revised instrument of .95. No reliability indices were generated for static information reflected in section four of the data collection instrument.

Methods/Procedures

This study followed the data collection protocol suggested by Dillman (2007); however, the researchers deviated by attempting four points of contact, rather than five. Prior to sending the first invitation message, a brief prenotice e-mail message was sent to the AAAE membership by the President of the AAAE via the AAAE electronic list-serve. The prenotice indicated the need to determine the profession's level of support for the *NRA* and noted the President's support for the study. Three personalized e-mail invitations followed the prenotice in approximately five-day intervals; each was written by a different researcher who was affiliated with a different research focus area so as to appeal to the various interest groups. E-mail invitations were sent using the Hosted Survey™ software to each of the AAAE members' e-mail addresses indicated on the on-line *Directory of the American Association for Agricultural Education.* Each e-mail invitation invited AAAE members to share their experiences and opinions about the AAAE and the *National Research Agenda*, and included a personalized link to the Web-based electronic questionnaire. As electronic questionnaires were completed the names of the individuals who had responded were removed from the correspondence list of AAAE members to avoid sending additional e-mail correspondence. A final response rate of 77.6% (n = 246) was obtained.

Non-response error was a relevant concern; therefore, procedures for handling nonrespondents were followed as outlined as *Method 1* in Lindner, Murphy, and Biers (2001). Respondents were dichotomously split into early and late respondent groups (Miller & Smith, 1983) to compare variables of interest: participative safety, support for innovation, vision, and task orientation. An independent samples t-test was used to compare the variables of interest and yielded no significant differences ($p > .05$) between early and late respondent data. Therefore, external validity did not threaten the generalizability of the findings of this study to the population (Lindner, et al.; Radhakrishna & Doamekpor, 2008).

Data Analysis

Data were analyzed using SPSS® version 17.0 for Windows™ platform computers. Research objective one sought to describe select professional characteristics of AAAE members. Therefore, frequencies and percentages for academic position, Research Priority Area focus, regional affiliation, AAAE membership status, and frequency of attendance at regional and national AAAE meetings were reported. Mean and standard deviation were reported for length of membership in AAAE, and length of employment at current institution. Research objective two sought to describe AAAE members' perceptions of the organizational climate of the AAAE. Subjects were asked to respond to 24 statements representing communication and innovation behaviors within the AAAE, and eight questions related to the task style of members of the AAAE, using a 5-point Likert-type scale to reflect levels of agreement. Mean, mode, and standard deviation were reported. Mode was included as a more conservative descriptor of central tendency. Research objective three sought to describe the level of the profession's support 2007-2010 version of the NRA. Subjects were asked to respond to 13 questions regarding the objectives of the AAAE and the NRA using a 5-point Likert-type scale to reflect levels of agreement. Mean, mode, and standard deviation were reported.

Findings

Research objective one sought to describe selected professional characteristics of AAAE members. Each subject was asked to describe his or her: academic position, research priority area focus, AAAE regional affiliation, and membership status, frequency of attendance at regional and national AAAE meetings. The results are summarized in Table 1. Length of membership in AAAE and length of employment at current institution are noted in Table 2.

Table 1
Professional Characteristics of AAAE Membership (n = 245)

Professional Characteristic	*f*	%
Academic Position		
Master's Graduate Student	3	1.2
Doctoral Graduate Student	36	14.7
Lecturer	10	4.1
Assistant Professor	57	23.3
Associate Professor	37	15.1
Professor	75	30.6
Professor Emeritus	4	1.6
Other	23	9.4
Research Priority Area focus[a]		
Agricultural Communications	28	7.6
Agricultural Leadership	39	10.6
Agricultural Education in Domestic and International Settings: Extension and Outreach	53	14.4
Agricultural Education in University and Postsecondary Settings	111	30.2
Agricultural Education in Schools	136	37.1
AAAE Regional affiliation		
North Central	78	31.8
Southern	110	44.9
Western	57	23.3
Attendance at regional AAAE meeting		
Every year	105	44.1
Most Years	64	26.9
Occasionally	50	21.0
Never	19	8.0
Attendance at national AAAE meeting		
Every year	87	36.6
Most Years	62	26.1
Occasionally	58	24.4
Never	31	13.0

Note: [a] data does not equal 100% because of members with multiple focus areas

Table 2
Professional Characteristics of AAAE Membership (n = 245)

Characteristic	*M*	*SD*
Length of membership in AAAE	11.38	10.05
Length of employment at current institution	9.29	9.16

Research objective two sought to describe members' perceptions of the AAAE organizational climate. Findings are presented by construct: participative safety (see Table 3), support for innovation (see Table 4), and task orientation (see Table 5). Items in each Tables 3 – 5 were ordered by mean score.

The overall construct mean for participative safety was 3.39 (*SD* = 0.64). One item related to participative safety had a mean score above four, indicating agreement with the statement: *we influence each other* (*M* = 4.02, *SD* = 1.73). The other 12 items related to participative safety has associated mean scores that ranged from 3.18 to 3.83 (see Table 3), indicating that members, on average, did not agree nor disagree with 12 of the 13 statements. However, based on mode, most respondents agreed with 12 of the 13 statements.

Table 3
Members' Perceptions of Items Related to Participative Safety (n = 245)

Item	*M*	Mode	*SD*
We influence each other.	4.02	4	0.73
We generally share information in the profession, rather than keeping it to ourselves.	3.83	4	0.85
We keep in regular contact with each other.	3.50	4	0.88
There are real attempts to share information throughout the AAAE.	3.49	4	0.95
We keep in touch with others in the association.	3.45	4	0.91
We have a 'we are in it together' attitude.	3.40	4	1.00
We interact frequently.	3.32	4	0.96
In the AAAE, people feel understood.	3.29	4	0.92
In the AAAE, people feel accepted.	3.29	4	1.06
Members of the AAAE meet frequently to talk *formally*.	3.28	4	0.99
People keep each other informed about work-related issues in the AAAE.	3.25	4	0.94
There is a lot of give-and-take.	3.22	3	0.94
Members of the AAAE meet frequently to talk *informally*.	3.18	4	1.03
Overall construct mean	3.39	–	0.64

Note: Scale: 1 = Strongly Disagree; 2 = Disagree; 3 = Neither Agree nor Disagree; 4 = Agree; 5 = Strongly Agree

Support for innovation had an overall construct mean of 3.15 (*SD* = 0.77); therefore, the members, on average, had neutral beliefs regarding nearly all of the statements related to support for innovation (see Table 4). Furthermore, the average members disagreed with the statements *the AAAE is open to change* (*M* = 2.96, *SD* = 1.09) and *the AAAE is responsive to change* (*M* = 2.96, *SD* = 1.07). Whereas, based on mode, most AAAE members agreed with nine of the 11 statements; indicating neutral beliefs (Mode = 3) regarding *the AAAE is always moving toward the development of new answers* and *the AAAE is responsive to change*. Therefore, the beliefs of AAAE membership for three items vary depending on the basis for interpretation (*M* versus Mode): *in the AAAE, we take the time needed to develop new ideas* (*M* = 3.03, *SD* = 1.00, Mode = 4); *the AAAE is open to change* (*M* = 2.96, *SD* = 1.09, Mode = 4); and *the AAAE is responsive to change* (*M* = 2.96, *SD* = 1.07, Mode = 3).

Table 4
Members' Perceptions of Items Related to Support for Innovation (n = 245)

Item	*M*	Mode	*SD*
People in the AAAE cooperate in order to help develop new ideas.	3.49	4	0.90
Assistance in developing new ideas is readily available.	3.45	4	0.93
Members of the AAAE *share* resources to help apply new ideas.	3.34	4	0.95
AAAE members provide practical support for new ideas and their application.	3.20	4	0.94
Members of the AAAE *provide* resources to help apply new ideas.	3.19	4	0.96
People in the AAAE are always searching for new ways of looking at problems.	3.15	4	0.97
Everyone's view is listened to, even if it is in a minority.	3.09	4	1.01
The AAAE is always moving toward the development of new answers.	3.07	3	1.00
In the AAAE, we take the time needed to develop new ideas.	3.03	4	1.00
The AAAE is open to change.	2.96	4	1.09
The AAAE is responsive to change.	2.96	3	1.07
Overall construct mean	3.15	--	0.77

Note: Scale: 1 = Strongly Disagree; 2 = Disagree; 3 = Neither Agree nor Disagree; 4 = Agree; 5 = Strongly Agree

The overall construct mean for task orientation was 3.05 (*SD* = 0.77). One-half of the eight items related to task orientation had mean scores that ranged from 3.16 to 3.42 (see Table 5), indicating that the average AAAE members agreed to some extent with those items. Levels of agreement varied with six items depending on the basis for interpretation –*M* versus Mode. Most AAAE members agreed that *there a real concern among AAAE members that the AAAE should achieve the highest standards of performance* (*M* = 3.42, *SD* = 0.98, Mode = 4) and their *AAAE colleagues provide practical help to enable [them] to do the job to the best of [their] ability* (*M* = 3.16, *SD* = 1.03, Mode = 4).

Table 5
Members' Perceptions of Items Related to Task Orientation (n = 245*)*

Item	*M*	Mode	*SD*
Is there a real concern among AAAE members that the AAAE should achieve the highest standards of performance?	3.42	4	0.98
Do your AAAE colleagues provide *useful ideas* to enable you to do the job to the best of your ability?	3.26	3	0.97
Do members of the AAAE build on each other's ideas in order to achieve the best possible outcome?	3.18	3	0.96
Do your AAAE colleagues provide *practical help* to enable you to do the job to the best of your ability?	3.16	4	1.03
Does the AAAE provide a clear criterion that members try to meet in order to achieve excellence as an association?	2.98	3	1.02
Are AAAE members prepared to question what the AAAE is doing?	2.95	3	1.08
Do you and your AAAE colleagues monitor each other so as to maintain a higher standard of work?	2.88	3	1.10
Does the AAAE critically appraise potential weaknesses in what it is doing in order to achieve the best possible outcome?	2.75	3	1.01
Overall construct mean	3.05	--	0.77

Note: Scale: 1 = To a very little extent ; 3 = To some extent; 5 = To a very great extent

Research objective three sought to describe the level of the membership's support of the 2007-2010 version of the NRA. The construct *vision* was used to assess the level of the profession's support 2007-2010 version of the NRA. Based on the overall construct mean of 3.41 (*SD* = 0.73), members were at least somewhat supportive of the NRA, but did not completely support the NRA (see Table 6). Most members were somewhat clear about the NRA, but not completely. Furthermore, most members believed the NRA was useful, appropriate, realistic, attainable, and achievable to some extent, but not completely. Moreover, most members believed the NRA was worthwhile for themselves, the AAAE, and wider society.

Table 6
Members' Support for the 2007-2010 Version of the National Research Agenda of the AAAE (n = 245)

Item	*M*	Mode	*SD*
How worthwhile do you think the *National Research Agenda* priorities are to the AAAE?	3.78	4	0.91
How clear are you about the *National Research Agenda Priorities*?	3.65	4	0.95
To what extent do you think the *National Research Agenda* priorities are useful priorities?	3.64	4	0.96
To what extent do you think the *National Research Agenda* priorities are appropriate priorities?	3.60	4	0.90

Item	*M*	Mode	*SD*
To what extent do you think the *National Research Agenda* priorities are realistic?	3.50	4	0.93
How worthwhile do you think the *National Research Agenda* priorities are to you?	3.49	4	1.06
To what extent do you think the *National Research Agenda* priorities can be attained?	3.42	4	0.92
To what extent do you think the *National Research Agenda* priorities can actually be achieved?	3.37	4	0.86
To what extent do you think other AAAE members agree with the *National Research Agenda* priorities?	3.37	3	0.76
How worthwhile do you think the *National Research Agenda* priorities are to the wider society?	3.24	4	1.08
To what extent do you think the *National Research Agenda* priorities are clearly understood by other members of the AAAE?	3.18	3	0.85
To what extent do you think members of the AAAE are committed to the *National Research Agenda* priorities?	3.08	3	0.85
Overall construct mean	3.41	--	0.73

Note: Scale: 1 = Not at all ; 3 = Somewhat; 5 = Completely

Conclusions, Implications, Recommendations

Research objective one sought to describe selected professional characteristics of AAAE members. The AAAE membership is balanced between organizational continuity, stability, and potential to change. One-half of the membership provides stability; holding positions as Associate Professor or Professor. Nearly one-third of the members are very experienced; holding Professor or Professor Emeritus titles and providing for organizational continuity. Nearly 25% of the organization’s members provide potential for change, holding positions as Assistant Professors. Each of the research focus areas in the profession are well represented. Although the majority of members describe their research focus area as agricultural education in schools or university and postsecondary settings, all research areas had sufficient faculty participation to achieve a critical mass. The Southern region is the largest region, representing nearly one-half of the total membership, followed by North Central and Western regions. Both the regional and national meetings are relevant and important to the membership; with a full two-thirds of the members attending the regional meetings, and nearly two-thirds attending the national meeting, every year or most years.

Research objective two sought to describe members’ perceptions of the AAAE organizational climate. Overall, AAAE members varied greatly when considering their responses to individual items related to participative safety, support for innovation, and task orientation. Members believed that they were influential toward each other, shared information, and frequently interacted. However, member’s beliefs varied greatly regarding levels of acceptance and whether the AAAE had a ‘we are in it together’ attitude—indicators that individuals may be concerned that the AAAE is not a safe or supportive environment to express their ideas without risk of appearing foolish or facing ridicule (Anderson & West, 1996). If AAAE members want to provide opportunities for individual and organizational growth, development, and renewal, then they must create an environment where members are willing to try out new ideas without fear of feeling foolish.

On average, members do not believe that the AAAE is open or responsive to change. Members neither agree nor disagree that the AAAE is moving toward the development of new answers. Members further indicated mixed beliefs regarding the collective accountability for excellence in performance of shared outcomes within the AAAE. Members, on average, agreed that they are influence one another—the only item to achieve a mean value above 4.0 (Agree). One might question how members can influence one another, yet the AAAE is not open and responsive to change? Should AAAE members not hold themselves accountable for being closed-minded or resistant to change? Is it everyone else's problem? Could it be indicative of the culture within the AAAE? It is likely that members' definition of influence differs because members' responses to items in the task orientation construct do not necessarily support that concept. For example, items with the highest mean scores indicate that members believe that the AAAE, as an organization, should achieve the highest standards of performance, and that their colleagues provide useful ideas and practical help. Nonetheless, items with the lowest mean scores in the task orientation construct indicate that members do not perceive their AAAE colleagues to monitor one another, or critically appraise potential weaknesses to achieve the best possible outcome. Who should monitor standards and to what extent?

Research objective three sought to describe the level of the membership's support of the 2007-2010 version of the NRA. The NRA priorities are somewhat understood, useful, and worthwhile to a majority of the AAAE membership. The data suggest that members on average thought that others in the profession were less supportive than they were about the NRA priorities. How will this misperception, that others in the profession are less supportive of the priorities, impact the revision and/or adoption of the next version of the NRA?

Most members support the NRA; however, questions remain about the role of the NRA. Additional questions arise when considering the question *the AAAE provides a clear criterion that members try to meet in order to achieve excellence as an association*—the average members' agreement lies somewhere between very little and to some extent. Does that indicate that members do not associate the NRA as the benchmark criterion for the AAAE, or that they discount the efficacy of the document to guide the AAAE? Perhaps guidance, in addition to the NRA, is necessary to guide the AAAE in developing a reciprocal relationship of give-and-take among members.

The results of this study indicate that most AAAE members agreed to some extent with the priorities established in the 2007 – 2010 NRA, and found them somewhat useful and appropriate. To a lesser extent, they believed the research priorities could be attained. The authors believe that this is due in part to a lack of communication, and recommend that the AAAE systematically collect and report progress on each of the research priority areas.

It is important that more inclusive and participative methods be employed in the current effort to amend and adjust the NRA priorities, and that the outcome of the second initiative be evaluated in a more timely fashion to prevent misperceptions from developing within the AAAE. Further research is necessary to determine whether members support the NRA in its entirety or only portions of the document. It is recommended that the second initiative, currently underway, include efforts to ascertain and communicate the purposes of the Research Agenda in the AAAE.

The climate of an organization can be relatively easy to change, but change in culture takes the full commitment of every leader within the organization for a sustained period of time (Hofstede, 1997). Therefore, based on the organizational climate of the AAAE, the leadership of the AAAE should develop a long-term written plan to improve the functionality of the AAAE and to serve as a guide in the future development of the organization—a plan that goes beyond conducting research and the NRA (e.g. development of new answers, disseminating agricultural education research to practitioners, professional development goals, etc.). Development of such a plan should include member input, to critically appraise and address potential weaknesses of the AAAE, and to achieve the best possible outcome. Lastly, it is suggested that the modified version of the TCI used in this study, should be used to measure change in the organizational climate of the AAAE over time, to provide the AAAE leadership with information that may better allow them to improve the functionality of the organization.

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Verbal Immediacy and Audio Technology Use in Online Course Delivery – What do agricultural education students think?

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Abstract

As demand for online course delivery increases, it is imperative that those courses be delivered in an effective and efficient manner. While technologies are offering increasingly new and innovative tools to deliver courses, it is not known which of these tools are perceived as useful and beneficial by agricultural education students. This study sought to measure the impact of using an audio/video communication tool (Jing™) within the online classroom environment in an effort to document the tool's value to students. *This multi-state study was conducted at land-grant universities in Arizona, Montana, and Texas and consisted of descriptive survey research. The instrument contained questions with specific focus on the use of Jing™ as an instructional tool and the relation of verbal communication to online learning. A total of 168 instruments were completed by participants. Thirty-one unique individuals completed all three rounds of the study. Findings revealed that gender and classification can impact perception of technology use in online courses. Implications exist in regard to the delivery of online courses. Participants reported strong agreement for each of the four constructs indicating that Jing™ was perceived as a useful tool that can meet the needs of students.*

Introduction and Theoretical Framework

As demand for online course delivery increases, it is imperative that those courses be delivered in an effective and efficient manner. Osika, Johnson, and Buteau (2009) reported that over two-thirds of colleges and universities are now offering a variety of online courses and programs. While technologies are offering increasingly new and innovative tools to deliver courses, it is not known which of these tools are perceived as useful and beneficial by agricultural education students. This study sought to measure the impact of using an audio/video communication tool (Jing™) within the context of the online classroom in an effort to document the tool's value to students. Jing™ is a "free software that adds visuals to your online conversations" (TechSmith Corporation, 2009, n. p.). Jing™ is a technology that allows one to capture images or video quickly and to easily share them with others by uploading the images or video onto a server.

Pruitt, Dicks & Tilley (2009) found that "instructors seen as entertaining, fair, and able to actively involve students are rated higher in teaching effort" (p. 29). Is it possible that tools such as Jing™ could be helpful in allowing instructors to be seen as actively involved and entertaining? In an article entitled "Updating Today's College Curriculum for Tomorrow's Agriculture," which was reprinted in June 2008 from a June 1987 article by Coorts, there are two specific curricular needs that are relevant to this study – "the need to continue improving communication skills of our students (both verbal and written)" (p. 20) and the "need to consider new approaches to teaching agriculture to our students" (p. 21).

In a case study conducted by Osika, Johnson, and Buteau (2009), it was found that factors positively influencing faculty use of instructional technologies included: past success with other technologies; perceived need for online learning; and flexible scheduling. Factors negatively influencing use of instructional technology included: infrastructure; problems with technology; and student abilities. The case study also revealed that positive factors influencing faculty who do not currently use technology in courses were the desire for flexibility, monetary rewards, and pressure from students. The most negative reason for not using technology was the overall opinion that distance learning is “impersonal, no face-to-face, no discussion, no substitute for a class” (p. 10). It was noted that strategies to increase faculty participation on methods to integrate technologies into online courses, such as workshops and seminars, should be conducted by universities to improve education in online course development.

Rhoades, Friedel, & Irani (2008) stated that research must be conducted to continue to determine which communication technologies are “perceived as entertainment tools versus information tools in students’ minds” (p.37). “It is important to provide the right type of information sources to gratify our students’ need for information” (Rhoades, Friedel, & Irani, 2008, p. 34). Bigelow (2009) found that one of the weaknesses of online courses was that there is “little opportunity to actually get to know the students on a personal basis” (p.7). A need to investigate technologies that could overcome these types of weaknesses exists.

There are both benefits and challenges to teaching online. Among the challenges is the difficulty in engaging in spontaneous verbal communication and providing meaningful feedback in context. Moore (1997) summarized the “theory of transactional distance” in distance education as a pedagogical concept that includes not only geographic distance but also the student-teacher relationship and self-directedness of the students. He shared that the separation of students and teachers allowed misunderstandings. He further shared, “It is this psychological and communications space that is the transactional distance” (p. 22). How can technology serve as a bridge for this distance? Diebel and Gow (2009) reiterated the importance of providing clear directions for students in regard to “class logistics” when offering online courses, and provided the example of offering “preview materials” (p. 13).

Ni and Aust (2008) define teacher verbal immediacy as “teachers’ verbal communication behaviors that reduce psychological distance in the interaction between teacher and student” (p. 480). Ni and Aust gave Andersen (1979) credit for initially connecting immediacy with instructional communication. Communication immediacy involves both verbal (e.g., humor) and non-verbal (e.g., smiling) behaviors. As shared by Ni and Aust (2008), online environments can lend themselves to verbal behaviors. While the study of verbal immediacy is new in online environments, the concept has been examined in face-to-face settings extensively. Gorham (1988) identified verbal teacher immediacy behaviors that can influence student learning. Of those behaviors listed, humor, individual conversations with students, feedback, teacher invitations to meet with students, and praise were indicated as important. Ni and Aust (2008) examined online classes and found that a “sense of classroom community” predicted “learner satisfaction and perceived learning”. The authors also found that teacher verbal immediacy increased student participation in online discussion boards. Arbaugh (2001) examined verbal immediacy behaviors and their effect on student satisfaction and learning in online courses. The author found that immediacy behaviors predicated student learning and also positively impacted course satisfaction. VanDerZanden & Woline (2008) found that students rated the use of audio high in the delivery of an online horticulture course.

Woods and Baker (2004) shared a conceptual model of interaction and immediacy in the setting of online learning. They stated, “research demonstrates that the integration of verbal and non-verbal immediacy communication behaviors lets instructors move from mere interaction to authentic intimacy and interpersonal closeness” (p. 2). These authors shared that failure to encourage motivation, engagement, and a positive social dynamic can result in isolation and attrition in the distance education setting. Documentation of learner needs in the literature emphasizes the importance of the study of new and emerging technologies as teaching tools. Murphy (1999) summarized attributes in Bloom’s Theory of School Learning that contribute to learning and emphasized the importance of the use of cues, positive reinforcement, corrective feedback, and student participation in learning. Prawat & Floden (1994) indicated dialogue was important to facilitate leaning. Pellegrino (2006) argued for the need to document student advancement over time instead of merely taking “snapshots” of progress and indicated technology has the potential to meet these needs and other shortcomings existing across learning environments. In a study conducted by Baker (2004), it was found that “the instructor significantly influences the learning process, even in the online classroom” (p.10). This study documented the benefit of “prosocial communication patterns in online instruction” (p.12) and called for the use of media rich tools to encourage instructor immediacy.

Dooley, Linder, and Richards (2003) reported, “it is not the media, but the methods, that make a difference in distance education” (p. 84). Huysman et. al. (2003) summarized research that stated “the uses and consequences of technology emerge rather unpredictably from complex social interactions” (p. 411). Cuban (1999) found that although university faculty are comfortable with using the Internet, less than 10% actually use online technologies for teaching. Ferguson (2004) indicated that teachers’ decisions to integrate technologies into instruction are based on teaching styles and strategies, as well as personal beliefs. Although there are many factors that affect the integration of technologies into courses, online instruction is becoming a necessity in higher education institutions and educators must learn to embrace the opportunities new technologies offer to meet student needs.

Purpose and Objectives

The purpose of this study was to describe the reaction of students to the use of an audio/video communication tool (Jing™) in online course delivery. Secondary purposes focused on understanding the importance of verbal communication and immediacy as they relate to student learning and satisfaction in an online environment. The objectives that guided this study were: (1) To describe the demographics of students that have used audio/video communication tools for course instruction, (2) To describe student use of Internet-based technologies, (3) To identify student perceptions of online course attributes, and (4) To determine whether the use of Jing™ impacts students’ perceptions of preferred attributes of online courses.

Methods and Procedures

Population

This multi-state study was conducted at land-grant universities in Arizona, Montana, and Texas. The accessible population consisted of 202 students (undergraduate and graduate) enrolled in four separate agricultural education courses taught at a participating university. Students were identified and purposively selected by researchers as being enrolled in a course that would use the technology Jing™ during the delivery of the course taught partially or completely online during Fall 2009.

Procedures

The design for this study was descriptive survey research. Data were collected using a researcher-developed instrument. The survey was assessed for face and content validity by a panel of university agricultural education faculty. Each panel member performed an evaluation to verify that the instrument contained correct criteria to accurately measure elements of communication, verbal immediacy, online course experience, and technology integration. Twenty-one agricultural education students participated in a pilot test to assess reliability. The pilot test revealed a Cronbach's alpha reliability coefficient (1951) of 0.81 and was deemed acceptable by the researchers.

Instrument

The instrument contained questions with specific focus on the use of Jing™ as an instructional tool and the relation of verbal communication to online learning. Questions were derived from the literature focused on technology integration and audio/visual communication in online settings. A set of 32 statements were created to ascertain student perceptions of online course attributes. These statements were derived from the literature and focused on four distinct constructs: preference for audio (8 statements), feedback and immediacy (6 statements), communication and interaction (12 statements), and social presence (4 statements). Two statements were independent of a construct. Six negative statements were reverse coded after data collection to match other statements prior to data analysis. Sample statements for the "Preference for Audio" construct included: *I prefer to listen to lectures rather than read my textbook*; *It is easier for me to 'say something out loud' rather than write it all down*. Sample statements for the "Feedback and Immediacy" construct included: *It is important for me to receive timely feedback on my assignments; Using my name and making eye contact with me is important when communicating with me.* Sample statements for the "Communication and Interaction" construct included: *Interaction with my classmates and my instructor is important to me; Audio is a critical part of my communication in an online course*. Sample statements for the "Social Presence" construct included: *Hearing my instructor gives me a feeling of closeness; Getting to know my instructor is important to me.*

The survey was administered three times throughout the semester to students exposed to the use of Jing™ in an effort to document change in student perception based on use of Jing™. The instrument was purposefully administered at the beginning, middle, and end of the semester in which in investigation took place. Each instrument contained an identical set of Likert Scale questions focused on perceptions of online courses. The Round 1 survey contained additional questions focused on background/demographics and technology awareness. The Round 2 survey contained additional questions regarding student reaction to the use of Jing™. And, the Round 3 survey contained additional questions regarding student reaction to the use of Jing™ and the effectiveness of using Jing™.

Data were collected during Fall 2009 via Survey Monkey™. Scales for statements for each construct were summated and then averaged to determine an overall perception score for each construct under investigation. Cronbach's alpha coefficient (1951) was used to determine summated scale reliabilities for each construct. Reliability scales for each construct in Round 1 were: Preference for Audio (0.78); Feedback and Immediacy (.77); Communication and Interaction (.86); and Social Presence (.84). Overall reliability scores for all 32 statements in each Round were: Round 1 (.93); Round 2 (.90); and Round 3 (.84). Researchers utilized a modified version of Dillman's (2000) tailored design method. A pre-survey e-mail was sent to 202 students on the first day of Fall 2009 semester courses. This notice informed participants of their selection for the study, announced the intent of the study, provided an overview of the research process, and gave notification of the forthcoming request for participation in the research. Participants were asked to complete three separate online surveys throughout the semester at specified times. The opening page of the online survey detailed the purpose of the study, instructions on how to complete the survey, and contained information about voluntary informed consent. Participants gave consent by clicking on the web-link prior to completion of each survey. Students provided their name in order to ensure appropriate participation and were entered into a drawing for gift cards as an incentive. However, once their name was confirmed as being a student in one of the courses under study, the name was replaced in the data set with a code reflecting their connection with the study. Institutional Review Board approval was received at all three institutions to conduct the study.

A total of 168 instruments were completed by participants exposed to the technology under investigation. The Round 1 instrument was sent during the first week of classes and yielded 63 responses (31.2% response rate); the Round 2 instrument was sent in the middle of the semester and yielded 56 responses (27.7% response rate); and the Round 3 instrument was sent during the last week of classes and yielded 49 responses (24.3% response rate). Each online instrument remained open for one week and during this time period, non-respondents were sent two email reminders. Thirty-one unique individuals completed all three rounds of the study. Nonresponse was not addressed in this paper. The responding sample was treated as a representative sample of the population, thus inferential statistics were used.

Data analysis was performed using SPSS 17.0 software package. Data were collected, coded, and analyzed by authors. Data were downloaded into SPSS to analyze frequencies, means, standard deviations, and analysis of variance. The alpha level was set a priori at 0.05. Descriptive statistics were conducted to describe the population and determine participant mean perceptions for each round of the survey. One Way Analysis of Variance (ANOVA) and Univariate ANOVA were performed to determine if significant differences existed within constructs in each round based on gender, age, degree classification, computer comfort, number of online courses taken, computer use, and course enrollment.

Findings

Objectives 1 & 2: Demographics and Computer Technology Use

Demographics were collected during Round 1 of the study and did not include students who selected to participate in only Rounds 2 or 3 of the study. Of the 63 participants, 30% were male and 70% were female. Forty-one percent of the participants were 18-20 years of age, 44% of the participants were 21-30 years of age and the remaining 14% of participants were over the age of 31. There were more undergraduate (65%) than graduate (35%) students who participated in the study. Twenty-eight percent of the participants reported the course currently enrolled in was their first online course, while the remaining 72% of participants had previously taken online courses. No participants reported being a non-user of computer technology. In fact, the majority of participants (90%) reported being either an intermediate or advanced user and the majority (95%) reported being comfortable with computer technology (Table 1).

Table 1
Participant Demographics (*N* = 63)*

Category	Subcategory	f[a]	%
Age	18-20	26	41.3
	21-30	28	44.4
	31-40	7	11.1
	41-50	1	1.6
	51 or over	1	1.6
Gender	Male	19	30.2
	Female	44	69.8
Classification	Undergraduate	41	65.1
	Graduate	22	34.9
Online Courses Completed	First Online Course	18	28.6
	1-3	27	42.9
	4-5	7	11.1
	5 or more	11	17.5
Computer Technology Use	Non-User	--	--
	Novice	6	9.5
	Intermediate	43	68.3
	Advanced	14	22.2
Comfort with Computer Technology	Not Comfortable	3	4.8
	Comfortable	37	58.7
	Very Comfortable	23	36.5

*Note: Only participants that completed Round 1 of the study provided demographic responses. Demographics for Round 1 are reported here.

The majority of participants reported high use of the Internet (95%) and Email (96%), while a much lower percentage reported the use of Blogs (36%) or Twitter (15%). Social Networks and YouTube use were reported by 89% of participants (Table 2).

Table 2
Participants' Reporting of Internet-based Technologies Use (N = 63)

	No		*Yes - Some*		*Yes – A Lot*	
	f	Percent	*f*	Percent	*f*	Percent
Internet Access (in the broad sense)	--	--	3	4.8	60	95.2
E-mail	--	--	2	3.2	61	96.8
Social Networks (e.g., Facebook™)	7	11.1	18	28.6	38	60.3
Blogs	40	63.5	19	30.2	4	6.3
Twitter™	53	84.1	6	9.5	4	6.3
YouTube	6	9.5	44	69.8	13	20.6

Objectives 3 & 4 – Student Perceptions of Online Course Attributes and Student Preferences

A total of 32 Likert Scale statements related to online course attributes and student preferences were provided to participants for response. These statements were divided into four constructs: preference for audio; feedback and immediacy; communication and interaction; and social presence. A review of responses by construct for each round revealed no significant difference between rounds for each construct (See Table 3).

Table 3
Descriptive Statistics by Construct for Students Preference for Online Course Attributes

	Round 1 (*n* = 63)		Round 2 (*n* = 56)		Round 3 (*n* = 49)	
	M	*SD*	*M*	*SD*	*M*	*SD*
Preference for Audio	2.81	.48	2.87	.39	2.82	.32
Feedback and Immediacy	2.94	.47	2.89	.41	2.89	.36
Communication and Interaction	2.88	.41	2.89	.35	2.86	.32
Social Presence	2.90	.58	2.90	.51	2.97	.46

Note: Strongly Disagree = 1.00 – 1.50; Disagree = 1.51 – 2.50; Agree = 2.51 – 3.50; Strongly Agree = 3.51 – 4.00.

Further analysis of each construct was conducted based on demographic variables. Analysis indicated a statistically significant difference ($\alpha = 0.05$) by gender existed for Round 2 and 3. Female respondents indicated a significantly higher agreement ($\alpha = 0.05$) for the construct "Feedback and Immediacy" for Round 2 and Round 3. Cohen's *d* (Cohen, 1977) indicated a large effect size for Round 3 between males and females for the "feedback and immediacy" construct. Medium effect sizes were revealed for Rounds 1 and 2. Analyses indicated no statistically significant differences ($\alpha = 0.05$) in any of the four constructs in the three Rounds based on age, course enrollment, or the number of online courses taken for any of the three rounds (Table 4).

Table 4
One-way ANOVA for "Feedback and Immediacy" Construct by Gender

Round		*n*	*M*	*SD*	*d*[a]	*F*	*Sig.*
Round 1	Male	19	2.79	.49	.45	3.02	.09
	Female	44	3.01	.46			
Round 2	Male	11	2.64	.48	.71	5.28	.03*
	Female	31	2.98	.41			
Round 3	Male	10	2.65	.29	1.17	7.90	.01*
	Female	27	2.99	.34			

[a]Cohen's measure of effect size (.20 = small, .50 = medium, .80 = large).
*$p < .05$.

Analysis of the three Rounds by student classification revealed undergraduate participants were statistically, significantly ($\alpha = 0.05$) higher in agreement for the construct "Feedback and Immediacy" than graduate participants. Cohen's *d* (Cohen, 1977) indicated large effect sizes for Round 3 between undergraduate and graduate students for the "feedback and immediacy" construct, while only small effect sizes were revealed in Rounds 1 and 2 (Table 5).

Table 5
One-way ANOVA for "Feedback and Immediacy" Construct by Classification

Round		*n*	*M*	*SD*	*d*[a]	*F*	*Sig.*
Round 1	Undergraduate	41	2.98	.45	.22	.65	.42
	Graduate	22	2.88	.51			
Round 2	Undergraduate	27	2.92	.44	.20	.36	.55
	Graduate	15	2.83	.47			
Round 3	Undergraduate	21	3.02	.28	1.00	6.34	.02*
	Graduate	16	2.74	.39			

[a]Cohen's measure of effect size (.20 = small, .50 = medium, .80 = large).
*$p < .05$.

Analyses indicated a statistically significant difference ($\alpha = .05$) between mean scores of participants by computer use when compared by each Round. Bonferroni post-hoc analysis of constructs "Preference of Audio" and "Social Presence" indicated a statistically significant difference ($\alpha = .05$) between the means of advanced and intermediate computer users in Round 3. Analyses indicated no other statistically significant differences ($\alpha = .05$) between computer user means in any other round or in any of the other constructs in Round 3 (Tables 6 and 7).

Table 6
ANOVA for "Preference for Audio" Construct by Computer Use

Round		*n*	*M*	*SD*	η^2	*F*	*Sig.*
Round 1	Novice	6	2.77	.51	.03	.84	.44
	Intermediate	43	2.86	.49			
	Advanced	14	2.67	.43			
Round 2	Novice	5	3.08	.26	.14	3.17	.05
	Intermediate	28	2.90	.37			
	Advanced	9	2.61	.37			
Round 3	Novice	5	2.83	.19	.32	7.89	.00*
	Intermediate	25	2.92	.32			
	Advanced	7	2.41	.25			

*$p < .05$.

Table 7
ANOVA for "Social Presence" Construct by Computer Use

Round		*n*	*M*	*SD*	η^2	*F*	*Sig.*
Round 1	Novice	6	2.88	.41	.03	1.06	.35
	Intermediate	43	2.97	.58			
	Advanced	14	2.71	.60			
Round 2	Novice	5	3.10	.29	.04	.81	.45
	Intermediate	28	2.91	.49			
	Advanced	9	2.75	.60			
Round 3	Novice	5	3.00	.31	.19	3.99	.03*
	Intermediate	25	3.06	.45			
	Advanced	7	2.54	.44			

*$p < .05$.

Conclusions, Implications, and Recommendations

Based on the finding that 28% of the participants were enrolled in their first online course, it can be concluded that even though the delivery of online courses is increasing, there are still students that are new to online course delivery. Educators must take this into consideration as they design online courses and not assume all students are familiar with how to navigate and use online course management systems. The inclusion of verbal immediacy behaviors, such as individual conversations, praise, and humor, can help to enhance students' first time experience with online classes, while also creating a supportive classroom environment critical for student success (Gorham, 1988; Ni & Aust, 2008).

The majority of participants reported high use and high comfort level with computers, indicating students do possess the abilities to engage in online courses, but not necessarily the knowledge. These findings can help alleviate faculty concerns about whether students have the abilities needed to use technologies (Osika, Johnson, & Buteau, 2009) and reinforce the importance of providing a detailed syllabus and explicitly clear directions on class logistics (Diebel & Gow, 2009).

Blogs and Twitter™ were only used by 6.3% of participants suggesting neither of these technologies are in high use by agricultural education students participating in this study. Although this finding cannot be generalized to all students, it does provide useful information for instructors when choosing appropriate technologies for online courses. The high percentage of participants reporting frequent use of social networks (e.g., Facebook™) may offer more valuable opportunities to connect and engage students in an online environment.

No significant differences were found between Rounds based on age, course enrollment, or the number of online courses completed. Thus, exposure to the technology Jing™ did not cause students' perceptions of online course attributes to significantly change over the course of the semester in the broad sense. However, the analysis of variance comparing participant responses by gender and classification revealed a significant change in perception for the constructs "preference for audio" and "feedback and immediacy" in Rounds 2 and 3. This suggests that exposure to technology can positively impact participants' perceptions based on gender and classification and indicates avenues for study as to why females indicated increased preference for feedback than males and why undergraduates indicated greater preferences for feedback and immediacy than graduates. These findings lead one to ask, how could instruction be tailored to meet these needs or improve the educational experience for these audiences? Further research on the effects of these variables on students' perceptions can provide valuable recommendations for instructors when developing online courses for these specific audiences.

Advanced computer users reported a significantly lower agreement for the "preference for audio" and "social presence" constructs in Round 3. This indicates students with extensive computer experience may have decreased need for audio and social engagement in online courses. Based on these findings, the question arises as to how instruction targeted for advanced users can be modified while still maintaining the learning integrity of the online instruction for all learning styles. Because online courses commonly have students with diverse computer backgrounds, educators must continue to incorporate a variety of teaching and learning methods. As Dooley, Linder, and Richards (2003) stated, "it is not the media, but the methods that make a difference in distance education" (p. 84). Having a mixture of audio, visual, and written communication instruction can help to reach all types and backgrounds of students in the course. Learning styles must not be overlooked in online instruction. Attention to this factor could improve the overall quality of instruction, as well as learner satisfaction.

Based on these conclusions, implications exist in regard to the delivery of online courses. Participants in the study reported strong agreement with each of the four constructs (preference for audio, feedback and immediacy, communication and interaction, and social presence). What does this mean for instructors? While agreement with these constructs did not deviate over the course of the semester, they remained high. Thus, it is recommended that instructors consider the use of the technology Jing™ in online or hybrid course delivery. Jing™ can be used in various ways to meet the needs of online students and create a more socially connected environment. Uses of Jing™ could include online discussion, grading of assignments, recording journal entries, documenting reflections, providing peer feedback, and presentations. Integrating various audio/visual communication tools into online courses can help to decrease transactional distance, improve verbal communication skills, create a more social learning environment, and incorporate new approaches to teaching agriculture.

The goal of this study was to further the understanding of online instruction and describe the reaction of students to the use of an audio/video communication tool (Jing™) in online course delivery. Overall, students found the inclusion of Jing™ into the course as a positive experience that allowed them to experiment with an audio/visual communication tool, enhance their social presence, interact with students and instructors, and receive constructive feedback. These findings lend support to the benefits of the inclusion of new technologies into online courses to enhance student learning and satisfaction. Although teaching online presents challenges, instructors must apply pedagogical knowledge to a new setting to meet the needs of a growing technological society.

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Laboratory Management In-Service Needs of Wyoming Secondary Agriculture Teachers

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Abstract

For school-based agricultural education teachers who manage and instruct students within an agricultural mechanics laboratory, the knowledge and skills needed to manage these facilities are essential for student safety and for an optimum educational environment (Bear & Hoerner, 1986). This study investigated the agricultural mechanics laboratory management in-service needs of Wyoming secondary agriculture teachers who are responsible for managing agricultural mechanics laboratories. Data were collected with a Web-based questionnaire designed to determine the teachers' perceptions of the importance of 70 selected agricultural mechanics laboratory management competencies and their self-assessed ability to perform those competencies. The Borich (1980) Needs Assessment Model was used to assess and evaluate the in-service needs of the teachers. This study found that Wyoming secondary agriculture teachers were in need of agricultural mechanics laboratory management in-service education in the areas of: first aid, correcting hazardous laboratory conditions, and general laboratory safety. Wyoming teacher educators, State agricultural education supervisory personnel, and local professional development coordinators should provide pertinent and continuous in-service education for Wyoming secondary agriculture teachers in the area of agricultural mechanics laboratory management through technical workshops, summer professional development conferences, and university instructed agricultural mechanics courses.

Introduction & Literature Review

School and community laboratories are where students often employ "learning by doing" and are an integral part of many agricultural education programs (Sutphin, 1984). Phipps and Osborne (1988) noted that a total secondary agricultural education program consists of three essential and interdependent components: classroom and laboratory instruction; Supervised Agricultural Experience (SAE); and student participation in the National FFA Organization. Each of these three components often use laboratories as a way to further enrich student learning experiences.

"Agricultural education programs offer many unique hands-on opportunities for students to develop both valuable academic and vocational skills" (Hubert, Ullrich, Lindner, & Murphy, 2003, p. 1), which especially holds true for agricultural mechanics education. Phipps and Osborne (1988) proposed that the primary objective of agricultural mechanics education is the development of the abilities necessary to perform the mechanical activities to be done in agriculture." Johnson, Schumacher, and Stewart (1990) noted that students learn important psychomotor skills in agricultural mechanics education and that much of the instruction takes place in the school agricultural mechanics laboratory. According to Osborne and Dyer (2000) agricultural education laboratories provide opportunities for students to actively engage in scientific inquiry and application.

Laboratory experiences are an integral component of agricultural mechanics instruction and efficient management of the school agricultural mechanics laboratory is essential in ensuring maximum student learning (Bear & Hoerner, 1986). Much of the instruction of agricultural mechanics information takes place in the laboratory setting (Johnson & Schumacher, 1989). Thus, a great deal of instructional time is spent in the agricultural mechanics laboratory. In many cases, up to two-thirds of the total instructional time in secondary agricultural education programs is devoted to laboratory instruction (Shinn, 1987). Furthermore, it has been estimated that in many courses, the time allocated for instruction in agricultural mechanics comprises 25% to 40% of the total instructional time (Phipps & Osborne, 1988). Because a substantial amount of instructional time is spent in agricultural mechanics laboratories throughout the U.S., it is imperative that secondary agriculture teachers receive agricultural mechanics laboratory management education.

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

To provide a safe and efficient laboratory learning environment for agricultural mechanics students, agricultural educators must possess the proper knowledge and skills associated with the agricultural mechanics laboratory (Saucier, Schumacher, Funkenbusch, Terry, & Johnson, 2008). Harper (1984) noted that students were often more safety conscious when their teachers followed proper safety practices, demonstrated accurate safety knowledge, provided a safe laboratory environment, conveyed a positive safety attitude, and relayed safety expectations to the students. Secondary agricultural mechanics instructors' preparation in safety practices was noted to be deficient in many areas in a study conducted in North Dakota (Swan, 1992). Dyer and Andreasen (1999) further suggested that new agriculture teachers were inadequately educated in safety and experienced teachers were even less safety conscious. Despite numerous studies that have noted a need for agricultural educators to possess and apply proper knowledge and skills associated with the agricultural mechanics laboratory, many agricultural educators do not receive adequate education prior to beginning their teaching careers or after accepting a teaching position (Foster, 1986). Barrick and Powell (1986) found that first year agriculture teachers rated managing laboratory learning as a highly important ability for agriculture teachers. The first year agriculture teachers in their study also indicated that their level of knowledge concerning the management of laboratory learning was low. According to Schlautman and Silletto (1992), teacher educators should utilize teaching experiences to better develop and enhance laboratory management skills for their students.

In a study of secondary agriculture teachers, Johnson, Schumacher, and Stewart (1990) reported that in Missouri, agriculture teachers had in-service needs in the area of agricultural mechanics laboratory management. They further reported that teachers had the greatest in-service needs in the area of safety. Schlautman and Silletto's (1992) study conducted in Nebraska found that secondary agriculture teachers had in-service needs in the areas of agricultural mechanics laboratory management safety and policy implementation. Similar results were reported by Fletcher and Miller (1995). In their study conducted in Louisiana, Fletcher and Miller reported that Louisiana secondary agriculture teachers were not using recommended safety practices or providing student safety and emergency equipment to the extent warranted by the hazards found in the agricultural mechanics laboratories. In a recent study conducted in Missouri, Saucier, Terry, and Schumacher (2009) reported that Missouri school-based agriculture teachers responsible for managing agricultural mechanics laboratories had professional development education needs in the areas of: maintaining and repairing agricultural mechanics laboratory tools and equipment, maintaining a safe agricultural mechanics laboratory, and storing, handling and disposing of hazardous materials.

Purpose and Objectives

According to the *National FFA Career Development Events Handbook*, "an agricultural mechanics education is comprised of strong technical content and complimented by the development of practical, hands-on skills (p. 43). Unless secondary agriculture teachers are competent in agricultural mechanics laboratory management, it is unlikely that they can safely and effectively guide agricultural education students in the development of practical, hands-on skills. A study to determine the competence and in-service educational needs of Wyoming secondary agricultural education teachers has not been conducted. Therefore, the purpose of this study was to describe the in-service needs of secondary agricultural education teachers in Wyoming who are responsible for managing an agricultural mechanics laboratory. The following research objectives guided the study:

1. Describe selected personal and professional characteristics of secondary agricultural education teachers in Wyoming.
2. Describe the perceived importance of selected competencies of agricultural mechanics laboratory management competencies by secondary agriculture teachers.
3. Describe secondary agricultural education teachers' perceived ability to perform selected agricultural mechanics laboratory management competencies.
4. Prioritize the agricultural mechanics laboratory management competencies and constructs in need of improvement, as perceived by secondary agriculture teachers.

Procedures

Population

The population for this non-experimental, quantitative study was secondary agriculture teachers in Wyoming during the spring of 2009. The *2008-2009 Wyoming Agricultural Education Directory*, included a total of 47 secondary agriculture teachers. Due to the relatively small number of subjects, a census (N = 47) was conducted to more accurately describe the characteristics of the population and eliminate potential errors associated with subject selection and sampling.

Instrumentation

The data collection instrument developed by Johnson, Schumacher, and Stewart (1990) and modified by Saucier, Terry, and Schumacher (2009) was used in this study. A two-section instrument was used to address the research objectives of this study. The first section consisted of a double-matrix containing 70 statements representing agricultural mechanics laboratory management competencies. The 5-point Likert-type scale, double-matrix allowed subjects to respond to each statement twice; once rating the perceived importance of each competency (1 = *No Importance*, 2 = *Below Average Importance*, 3 = *Average Importance,* 4 = *Above Average Importance*, 5 = *Utmost Importance*), and once rating the individual's ability to perform each competency (1 = *No Ability*, 2 = *Below Average Ability*, 3 = *Average Ability,* 4 = *Above Average Ability*, 5 = *Exceptional Ability*). The second section sought to identify individuals' demographic characteristics (e.g., age, gender, years of teaching experience, highest degree obtained).

The instrument developed by Johnson and Schumacher (1989) included 50 competencies developed through a modified Delphi technique, with input from a national panel of agricultural mechanics education experts, and was reported to be valid. Johnson, Schumacher, and Stewart (1990) modified Johnson and Schumacher's instrument to include a double-matrix format to assess the perceived importance of each competency and the perceived ability of the individual to perform each competency. A later study (Saucier, et al., 2009) modified Johnson, Schumacher, and Stewart's instrument by splitting multiple-component or *double-barreled* and *triple-barreled* competencies into single-component competencies; thus, the original 50 competencies were expanded to 70 competencies.

The design and format of the data collection instrument was guided by the suggestions of Dillman (2007). The electronic questionnaire was created and distributed to a panel of experts using Web-hosted software provided by Hosted Survey™ to assess face validity. The panel of eight experts consisted of faculty members from two Land-Grant Universities, the Wyoming State FFA advisor, and the researchers.

Saucier et al. (2009) assessed content validity of their instrument using a panel of experts that consisted of agricultural education and agricultural systems management faculty members who judged the instrument to be valid. The panel further identified five constructs: laboratory and equipment maintenance; laboratory teaching; program management; tool, equipment, and supply management; and laboratory safety. This study used the exact competencies previously determined to be valid in the study conducted by Saucier et al.; therefore, the constructs were considered to be valid.

To estimate reliability of the instrument for this study, Cronbach's alpha coefficients were calculated using data collected in a study of secondary agriculture teachers in Missouri during 2008 (n = 110). Because data were collected in a similar manner, from a sample with similar characteristics, using the same data collection instrument used in this study, the data were deemed appropriate to estimate reliability of the data collection instrument for use in this study. Therefore, Cronbach's alpha coefficients were calculated for the scales (importance and ability), yielding coefficients of .97 and .97 (n = 110) respectively. The Cronbach's alpha coefficients for the five constructs (Saucier, et al., 2009)—laboratory and equipment maintenance; laboratory teaching; program management; tool, equipment, and supply management; and laboratory safety—ranged from .87 to .90 (n = 110).

Methods

Dillman's (2007) data collection protocol was followed for this study. After five points of contact, a response rate of 85.10% (n = 40) was obtained. Non-response error was a relevant concern; therefore, procedures for handling nonrespondents were followed as outlined as *Method 1* in Lindner, Murphy, and Biers (2001). The relatively small population size (N = 47) did not allow for a dichotomous grouping of at least 30 respondents. Therefore, a nonparametric comparison was made between early and late respondents by dichotomously grouping respondents to compare the variables of interest (Miller & Smith, 1983). A Pearson's χ^2 analysis yielded no significant differences ($p > .05$) between early and late respondent data; therefore, external validity did not threaten the generalizability of the findings of this study to the target population (Lindner, et al.).

Data Analysis

Data were analyzed using SPSS® version 17.0 for Windows™ platform computers. In determining the appropriate analysis of the data, the primary guidance was scales of measurement as outlined by Ary, Jacobs, Razavieh, and Sorensen (2006). Research objective one sought to describe the demographic characteristics of secondary agriculture teachers in Wyoming; thus, frequencies and percentages for gender, level of academic degree attained, and enrollment in agricultural mechanics courses during high school were reported. Mean and standard deviation were reported for age, length of teaching experience, and number of classes taught per semester that include agricultural mechanics competencies.

Research objective two sought to describe the perceived importance of selected competencies of agricultural mechanics laboratory management competencies by secondary agriculture teachers. Research objective three sought to describe secondary agricultural education teachers' perceived ability to perform selected agricultural mechanics laboratory management competencies. Secondary agriculture teachers were asked how important each competency was to them and what was their ability to perform each competency. Mean, standard deviation, minimum value, and maximum value were reported.

Research objective four sought to prioritize the agricultural mechanics laboratory management competencies and constructs in need of improvement, as perceived by secondary agriculture teachers in Wyoming. To determine where discrepancies existed, two ratings had to be taken into account simultaneously; hence, the Borich (1980) needs assessment model was utilized to determine the discrepancy for each competency. A discrepancy score was determined by taking the importance rating minus the ability rating for each respondent on each activity. A weighted discrepancy score was then calculated by multiplying each discrepancy score by the associated mean importance rating. Lastly, a mean weighted discrepancy score (MWDS) was calculated by taking the sum of the weighted discrepancy scores for each competency and dividing it by the number of respondents. To prioritize the competencies in need of attention, competencies were ranked, from high to low, using the mean weighted discrepancy scores. To prioritize the constructs in need of attention, a mean of MWDS ($\overline{x}_{\text{MWDS}}$) was calculated for each construct. Constructs were then ranked from high to low, using the $\overline{x}_{\text{MWDS}}$. Competencies or constructs with high MWDS, or $\overline{x}_{\text{MWDS}}$, indicated the areas needing the most improvement.

Findings

Research objective one sought to describe the personal and professional characteristics of secondary agricultural education teachers in Wyoming. Thirty-seven secondary agriculture teachers responded to the electronic questionnaire. Demographic data for gender, level of academic degree attained, and enrollment in agricultural mechanics courses during high school are reported in Table 1. Table 2 contains demographic data for age, length of experience, and number of classes taught per semester that include agricultural mechanics competencies.

Table 1
Selected Demographics of Secondary Agriculture Teachers in Wyoming (n = 37)

Characteristic	*f*	%
Gender		
Male	26	70.30
Female	11	29.70
Highest degree achieved		
Bachelor’s	23	62.20
Master’s	14	37.80
Enrolled in agricultural mechanics classes during high school		
Yes	29	78.40
No	8	21.60

Table 2
Selected Demographics of Secondary Agriculture Teachers in Wyoming (n = 37)

Characteristic	*M*	*SD*	*Min*	*Max*
Age	37.00	10.60	23	60
Years of teaching experience	11.86	9.51	1	35
Classes taught per semester that include agricultural mechanics competencies	4.03	1.99	0	7

Research objective two sought to describe secondary agriculture teachers’ perceived levels of importance of selected competencies of agricultural mechanics laboratory management. Providing students safety instruction (M = 4.89; SD = 0.31), selecting protective equipment for student use (M = 4.68; SD = 0.58), enforcing a student discipline policy (M = 4.65; SD = 0.59), and documenting student safety instruction (M = 4.62; SD = 0.59) were perceived to be the competencies with the highest levels of importance; all of which were related to maintaining a safe laboratory environment for students. Two competencies had mean importance values less than 3.0, and therefore, were perceived to have a below average level of importance: conducting an agricultural mechanics public relations program (M = 2.95; SD = 0.94), planning an agricultural mechanics public relations program (*M* = 2.81; *SD* = 0.88); both related to activities that do not take place in the laboratory environment.

Research objective three sought to describe secondary agriculture teachers' perceived ability to perform selected agricultural mechanics laboratory management competencies. Mean values of secondary agriculture teachers' perceived ability to perform selected competencies ranged from 2.95 to 4.29. Secondary agriculture teachers' perceived themselves as possessing an average ability to perform 90% (n = 60) of the 70 competencies. Secondary agriculture teachers' perceived themselves as possessing a below average ability to plan an agricultural mechanics public relations program (*M* = 2.95; *SD* = 0.74). Whereas, secondary agriculture teachers' perceived themselves as possessing an above average ability to perform six competencies: providing students safety instruction (*M* = 4.29; *SD* = 0.70), selecting protective equipment for student use (*M* = 4.16; *SD* = 0.73), developing a student discipline policy (*M* = 4.14; *SD* = 0.79), maintaining a student discipline policy (*M* = 4.05; *SD* = 0.85), documenting student safety instruction (*M* = 4.05; *SD* = 0.70), and safely handling hazardous materials (*M* = 4.00; *SD* = 0.75).

Research objective four sought to prioritize the agricultural mechanics laboratory management competencies and constructs in need of improvement, as perceived by secondary agriculture teachers in Wyoming. MWDS of agricultural mechanics laboratory management competencies ranged from 4.15 to -0.75. The competencies with the highest MWDS were related to safety, with the highest discrepancy (MWDS = 4.15) associated with administering first aid. One competency—ordering equipment/tools/supplies—had a MWDS of 0.00; therefore, no discrepancy existed. Seven competencies (10%)—silhouetting tool/ equipment cabinets (MWDS = -0.08); maintaining computer based student academic records (MWDS = -0.10); conducting an agricultural mechanics public relations program (MWDS = -0.24); planning an agricultural mechanics public relations program (MWDS = -0.38); storing protective equipment for student use (MWDS = -0.41); developing computer based lab management reports (MWDS = -0.49); and constructing welding booths, work benches, storage areas, etc. (MWDS = -0.75)—had negative MWDS and were considered a negative discrepancies. The negative MWDS indicates that the secondary agriculture teachers' perceived ability to perform each competency was higher than the perceived levels of importance of the associated competency.

Agricultural mechanics laboratory management constructs in need of improvement were ranked from high to low using the $\overline{x}_{\mathrm{MWDS}}$. Laboratory safety was the construct most in need of improvement ($\overline{x}_{\mathrm{MWDS}} = 2.72$); followed by laboratory and equipment maintenance ($\overline{x}_{\mathrm{MWDS}} = 1.51$); laboratory teaching ($\overline{x}_{\mathrm{MWDS}} = 1.27$); and tool, equipment, and supply management ($\overline{x}_{\mathrm{MWDS}} = 1.21$). Program management ($\overline{x}_{\mathrm{MWDS}} = 1.27$) was the construct least in need of improvement.

Additional data regarding secondary agriculture teachers' perceived levels of importance of agricultural mechanics laboratory management competencies, perceived ability to perform competencies, and MWDS of agricultural mechanics laboratory management competencies are presented in Table 3, ranked by MWDS. Definitions of agricultural mechanics laboratory management competencies (Saucier et al., 2009) are provided in Table 4. Grand means for importance of competencies, grand means for ability to perform competencies, and $\overline{x}_{\mathrm{MWDS}}$ for agricultural mechanics laboratory management constructs are reported in Table 5.

Table 3
Wyoming Secondary Agriculture Teachers' Perceptions of Agricultural Mechanics Laboratory Management Competencies (n = 37)

			Importance		Ability	
Rank	Activity	MWDS	*M*	*SD*	*M*	*SD*
1	Administering first aid.	4.15	4.51	0.65	3.59	0.96
2	Correcting hazardous laboratory conditions.	3.95	4.57	0.60	3.70	0.78
3	Properly installing and maintaining safety devices and emergency equipment (e.g., fire extinguishers, first aid supplies, machine guards, etc.)	3.59	4.43	0.69	3.62	0.89
4	Safely disposing of hazardous materials (e.g., flammables, acids, compressed gas cylinders).	3.54	4.51	0.73	3.73	0.77
5	Maintaining the agricultural mechanics laboratory in compliance with OSHA standards.	3.51	4.32	0.75	3.51	0.80
6	Conducting regular safety inspections of the laboratory.	3.35	4.43	0.65	3.68	0.78
7	Modifying facilities to accommodate students with disabilities.	3.22	3.83	0.93	3.00	0.85
8	Developing a system to document achievement of student competencies.	3.12	4.27	0.77	3.54	0.84
9	Developing a maintenance schedule for agriculture mechanics equipment.	3.07	4.05	0.81	3.29	0.85
10	Providing students safety instruction.	2.91	4.89	0.31	4.29	0.70
11	Developing an accident reporting system.	2.88	4.43	0.65	3.78	0.89
12	Modifying equipment to accommodate students with disabilities.	2.84	3.76	0.89	3.00	0.78
13	Maintaining healthy environmental conditions in the laboratory.	2.72	4.38	0.68	3.76	0.68
14	Documenting student safety instruction.	2.62	4.62	0.59	4.05	0.70
15	Maintaining a student discipline policy.	2.62	4.62	0.59	4.05	0.85
16	Safely handling hazardous materials.	2.59	4.57	0.65	4.00	0.75
17	Developing a procedure to bill students for materials used in project construction.	2.49	4.19	0.70	3.59	0.80
18	Operating within the constraints of an agricultural mechanics budget.	2.49	4.19	0.78	3.59	0.96
19	Making major agricultural mechanics lab equipment repairs.	2.45	3.78	0.98	3.14	0.98
20	Selecting protective equipment for student use (e.g., safety eyewear.)	2.40	4.68	0.58	4.16	0.73
21	Safely storing hazardous materials.	2.28	4.43	0.77	3.92	0.86
22	Enforcing a student discipline policy.	2.26	4.65	0.59	4.16	0.83
23	Developing an identification system to deter tool/equipment theft.	2.19	3.86	0.75	3.29	0.85

(continued)

Rank	Activity	MWDS	Importance		Ability	
			M	*SD*	*M*	*SD*
24	Performing routine maintenance of agricultural mechanics lab equipment (e.g., adjust belt tension, lubricate moving parts, dress grinding wheels.)	2.02	4.16	0.60	3.68	0.88
25	Estimating time required for students to complete projects/activities.	1.98	3.86	0.79	3.35	0.75
26	Diagnosing malfunctioning agricultural mechanics lab equipment.	1.97	3.84	0.99	3.32	0.91
27	Arranging equipment in the agricultural mechanics lab to enhance safety/ efficiency/learning.	1.90	4.14	0.82	3.68	0.75
28	Developing a student discipline policy.	1.84	4.54	0.56	4.14	0.79
29	Developing educational projects/activities for students.	1.81	3.95	0.81	3.49	0.80
30	Developing a written statement of agricultural mechanics lab policies/ procedures.	1.78	4.38	0.76	3.97	0.87
31	Developing procedures to facilitate the storage/checkout/security of tools/equipment.	1.70	3.70	0.78	3.24	0.80
32	Developing an agricultural mechanics laboratory budget.	1.68	4.14	0.67	3.72	0.87
33	Maintaining protective equipment for student use (e.g., safety eyewear.)	1.65	4.35	0.82	3.97	0.73
34	Recognizing characteristics of quality tools/equipment.	1.55	4.10	0.70	3.73	0.80
35	Developing objective criteria for evaluation of student projects /activities.	1.52	4.03	0.64	3.68	0.72
36	Updating agricultural mechanics course offerings.	1.50	3.70	0.88	3.28	0.81
37	Promoting laboratory safety by color coding equipment/marking safety zones/posting appropriate safety signs and warnings.	1.44	3.81	0.97	3.43	0.83
38	Developing an adequate inventory of laboratory consumable supplies.	1.38	3.92	0.76	3.57	0.83
39	Developing a file of service/operator manuals for agricultural mechanics lab equipment.	1.35	3.84	0.87	3.49	0.93
40	Equipping work stations for each skill area (e.g., cold metal, arc welding, small engines, electricity, etc.)	1.28	3.95	0.81	3.62	0.86
41	Developing a procedure to insure proper agricultural mechanics lab clean up.	1.22	4.11	0.77	3.81	0.81
42	Making minor agricultural mechanics lab equipment repairs.	1.20	4.02	0.76	3.73	0.90
43	Utilizing technical manuals to order replacement/repair parts for agricultural mechanics lab equipment.	1.14	3.84	0.80	3.54	0.90
44	Maintaining a file of service/operator manuals for agricultural mechanics lab equipment.	1.11	3.72	0.73	3.43	0.83

(continued)

Rank	Activity	MWDS	Importance		Ability	
			M	*SD*	*M*	*SD*
45	Making minor repairs to the agricultural mechanics laboratory facility.	1.09	4.03	0.73	3.76	0.68
46	Installing stationary power equipment (e.g., assembling equipment, connecting to a power source, performing preliminary adjustments.)	1.08	3.65	0.86	3.35	0.86
47	Arranging for a professional service person to make major equipment repairs (e.g., replace switches bearings.)	1.02	4.19	0.81	3.95	0.88
48	Identifying equipment required to teach agricultural mechanics skills.	1.01	4.14	0.67	3.89	0.88
49	Identifying supplies required to teach agricultural mechanics skills.	0.98	4.02	0.76	3.78	0.85
50	Developing a rotational plan to move students through agricultural mechanics skill areas.	0.98	3.62	0.95	3.35	0.95
51	Maintaining an adequate inventory of consumable supplies.	0.92	3.78	0.71	3.54	0.69
52	Maintaining a file of educational projects/activities.	0.90	3.45	0.69	3.70	0.70
53	Selecting current references/technical manuals.	0.85	3.49	0.69	3.24	0.68
54	Developing a file of educational projects/activities for students.	0.81	3.73	0.80	3.51	0.73
55	Identifying tools required to teach agricultural mechanics skills.	0.66	4.08	0.76	3.92	0.89
56	Identifying current references/technical manuals.	0.65	3.46	0.65	3.27	0.61
57	Planning student recruitment activities for the agricultural mechanics program.	0.65	3.46	1.04	3.27	0.96
58	Conducting shop inventory (e.g., tools/equipment/consumable supplies.)	0.64	3.97	0.69	3.81	0.78
59	Implementing student recruitment activities for the agricultural mechanics program.	0.64	3.40	0.90	3.21	0.89
60	Designating work stations for each skill area (e.g., cold metal, arc welding, small engines, electricity, etc.)	0.60	3.70	0.81	3.54	0.73
61	Developing procedures for efficient storage/distribution of consumable supplies.	0.50	3.68	0.85	3.54	0.69
62	Preparing bid specifications for equipment/tools/supplies.	0.46	3.40	0.83	3.27	0.80
63	Ordering equipment/tools/supplies.	0.00	3.59	0.72	3.59	0.69
64	Silhouetting tool/ equipment cabinets.	-0.08	3.03	1.01	3.05	1.00
65	Maintaining computer based student academic records.	-0.10	3.72	0.87	3.76	0.83
66	Conducting an agricultural mechanics public relations program.	-0.24	2.95	0.94	3.03	0.83
67	Planning an agricultural mechanics public relations program.	-0.38	2.81	0.88	2.95	0.74

(continued)

Rank	Activity	MWDS	Importance *M*	Importance *SD*	Ability *M*	Ability *SD*
68	Storing protective equipment for student use (e.g., safety eyewear.)	-0.41	3.78	0.82	3.89	0.66
69	Developing computer based lab management reports.	-0.49	3.00	0.97	3.16	0.88
70	Constructing welding booths, work benches, storage areas, etc.	-0.75	3.46	0.80	3.68	0.97

Note: Importance Scale: 1 = No Importance, 2 = Below Average Importance, 3 = Average Importance, 4 = Above Average Importance, 5 = Utmost Importance; Ability Scale: 1 = No Ability, 2 = Below Average Ability, 3 = Average Ability, 4 = Above Average Ability, 5 = Exceptional Ability

Table 4

Definitions of Agricultural Mechanics Laboratory Management Competency Constructs (Saucier et al., 2009)

Competency Construct	Definition
Laboratory safety	Activities that an agriculture teacher must perform to maintain a safe laboratory learning environment
Laboratory and equipment maintenance	Maintenance activities that an agriculture teacher must perform to keep the laboratory and equipment in working order
Laboratory teaching	Educational activities conducted in the laboratory by the agriculture teacher to ensure academic and vocational success
Tool, equipment, and supply management	Activities conducted by the agriculture teacher to ensure that all tools, equipment, and supplies are secured and in proper quality and quantity to facilitate the learning process
Program management	Activities conducted by the agriculture teacher to plan, guide, assess, and evaluate the agricultural mechanics program

Table 5

Wyoming Agricultural Mechanics Laboratory Management Competency Constructs Ranked by $\bar{x}_{\text{MWDS}}$ *(n = 37)*

Rank	Competency Construct	$\bar{x}_{\text{MWDS}}$	Importance $\bar{X}$	Importance *SD*	Ability $\bar{X}$	Ability *SD*
1	Laboratory safety	2.72	4.40	0.43	3.79	0.52
2	Laboratory and equipment maintenance	1.51	3.90	0.47	3.51	0.55
3	Laboratory teaching	1.27	3.98	0.48	3.67	0.56
4	Tool, equipment, and supply management	1.21	3.86	0.48	3.57	0.51
5	Program management	1.12	3.77	0.51	3.50	0.50

Conclusions–Implications–Recommendations

Wyoming secondary agriculture teachers require in-service training to address discrepancies that exist between the teachers' perceived importance of agricultural mechanics laboratory management competencies and their ability to perform the competencies. Although secondary agriculture teachers in Wyoming varied greatly in experience from one to 35 years, more than one-third hold a master's degree, and most had at least participatory experience in agricultural mechanics as high school students. Nonetheless, the average secondary agriculture teacher in Wyoming is required to teach four courses per semester that involve some facet of agricultural mechanics.

Secondary agriculture teachers in Wyoming recognized agricultural mechanics laboratory management competencies as being important. Nearly all of the competencies were determined to be at least of average importance, nearly half of which were perceived as being of above average importance. Secondary agriculture teachers' perceived themselves as being able to perform most of the competencies at an average level and very few competencies at an above average level. Most of the agricultural mechanics laboratory management competencies that Wyoming secondary agriculture teachers require in-service education in are related to safety. Similarly, agricultural mechanics laboratory management constructs in need of improvement were related to tasks required to maintain a safe laboratory learning environment and to keep the laboratory and equipment in working order. Wyoming secondary agriculture teachers are most competent in program management activities that are necessary to plan, guide, assess, and evaluate the agricultural mechanics program.

Secondary agriculture teachers must be competent and knowledgeable. In some cases, teachers must teach up to seven courses per semester, possibly early in their careers and with limited experience. Agricultural mechanics laboratories can be an invaluable resource to agriculture teachers. Well prepared and knowledgeable agriculture teachers can safely and effectively guide agricultural education students in the development of practical, hands-on skills and agricultural mechanics education. However, without competent and knowledgeable agriculture teachers, the agricultural mechanics laboratory can quickly become an underutilized and unsafe environment.

In-service education is necessary to address discrepancies that exist between the teachers' perceived importance of agricultural mechanics laboratory management competencies and their ability to perform the competencies. In-service education cannot address all discrepancies at once; therefore, pertinent and continuous in-service education should be facilitated each year and focus on one agricultural mechanics laboratory management competency at a time beginning with the highest priority construct—laboratory safety. To further address the in-service discrepancies of secondary agriculture teachers, teacher education programs must provide the necessary pre-service coursework to develop well prepared and knowledgeable agriculture teachers who can safely and effectively educate students in the development of agricultural mechanics knowledge and competencies. A longitudinal study of pre-service and in-service secondary agriculture teachers' perceived importance of agricultural mechanics laboratory management competencies and their ability to perform the competencies would provide teacher education programs an additional gauge of the adequacy of agricultural mechanics curriculum in their preservice teacher education program.

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Entry-level Technical Skills that Agricultural Industry Experts Expect Students to Learn through Participation in the Supervised Agricultural Experience Component of Secondary Agricultural Education: A Delphi Study

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Abstract

The National Research Council's (NRC) Report (1988), Understanding Agriculture: New Directions for Education, called on secondary agricultural education to shift its scope and purpose, including students' supervised agricultural experiences (SAEs). The NRC asserted that this shift should create opportunities for students to acquire supervised experience in land laboratories, agricultural mechanics laboratories, greenhouses, nurseries, and other facilities provided by schools. For example, the agricultural industry offers 52,000 job opportunities annually, including sales and marketing, specialty veterinary medicine, food safety/biosecurity, forest ecosystem management, precision agriculture, biomaterials engineering, landscape horticulture, plant and animal genetics, specialty crops production and nutrition services (Goecker, Gilmore, Smith, & Smith, 2005). Students' SAEs should reflect such aspects of the industry. Using a modified Delphi technique, this study identified the perceptions of agricultural industry experts on the role of SAE in facilitating students learning technical skills needed for entry-level employment. The experts expected that students would learn more entry-level technical skills associated with the career pathways of Animal Science and Agricultural Communications (44 of 60) than the other five pathways combined as a result of their participation in SAEs. This paper explores rationale regarding why it is important to address this "imbalance" and makes recommendations about that.

Introduction and Conceptual Framework

SAE is the part of agricultural education that allows students to practice in a work setting (placement) or an entrepreneurial (ownership) environment what they have learned in the classroom or laboratory (Talbert, Vaughn, Croom, & Lee, 2007). These work-based learning experiences are a component of agricultural education that sets it apart from many other programs or subjects in most secondary schools.

Roberts and Ball (2009; Figure 1) reported that a review of early secondary agricultural education curricula (i.e., Stimson, 1920) revealed the focus of curricula was on the development of specific skills. This behaviorist framework for content-centered secondary agricultural education has been the foundation for much of its curriculum (Phipps, Osborne, Dyer, & Ball, 2008; Talbert et al., 2007), which has focused on preparing skilled workers for the industry of agriculture.

SAE is one of the critical components of secondary agricultural education's "three-circle" model of program delivery. Agricultural education's proponents have touted the benefits of this critical component of the program because it includes acceptance of responsibility, development of self-confidence, opportunity to learn independently, development of independence, and learning to work with others as student learning experiences (Pals, 1988). In so far as students developing favorable work attitudes, Dyer and Williams (1997) spoke to the knowledge and skills students acquire in that regard through SAE placement opportunities particularly.

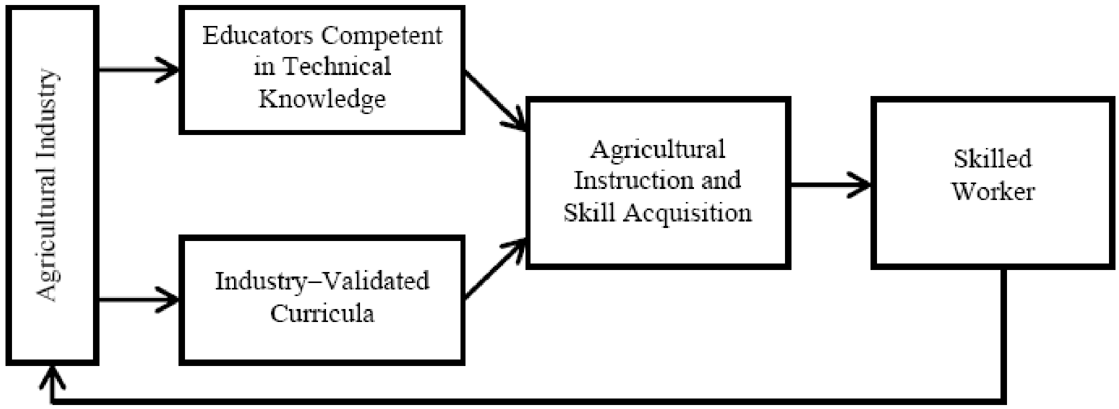

Figure 1. A content-based model for teaching agriculture (Taken from Roberts & Ball, 2009)

The abovementioned content-based model of teaching agriculture would resonate with the early proponents of vocational education. Stimson's project method of teaching and Prosser's focus on industry specific training can be found in both the "industry-validated curricula" and the emphasis placed on "agricultural instruction and skill acquisition" (Roberts & Ball). Regarding a model of secondary agricultural education that focuses on the "melding" or integrating of classroom and laboratory instruction, youth development, and experiential learning, an observer can identify easily the opportunity for skill acquisition occurring through secondary agricultural education's hallmark experiential learning component, supervised agricultural experience.

However, the decline in delivery of this facet of the model (Baggett-Harlin & Weeks, 2000; Dyer & Osborne, 1995 Steele, 1997) has implications regarding agricultural education's role in the preparation of students for entry-level positions in the agricultural industry. For example, the skills being learned may not be congruent with today's agricultural industry standards. This discrepancy may be contributing to a decline in students participating in SAEs. However, little is known about reasons for that "decline," especially from an empirical perspective.

Today's workplace reflects the many changes that have occurred over the past century, from emergence of the information age to the shift to a global economy; accordingly, the workplace requires a different set of skills (Ruffing, 2006). The career cluster Agriculture, Food and Natural Resources (AFNR) consists of seven career pathways that can be used to facilitate students acquiring the skills needed for entry-level employment in the 21st century ([State] Department of Career and Technology Education, 2009; Ruffing, 2006). Federal lawmakers, through authorization of Perkins IV legislation, called for the development of "programs of study" at both secondary and post-secondary levels that would be aligned with industry-recognized standards. These "career pathways are programs of academic and technical study that integrate classroom and real-world learning organized around industry" (Hoachlander, 2008, p. 23). This study focused on the SAE component of the comprehensive model of agricultural education and its potential for facilitating students learning entry-level technical skills associated with the career pathways of the AFNR career cluster. However, if a primary purpose of secondary agricultural education is to prepare students for entry-level employment in the agricultural industry (Phipps et al., 2008), what is known about the views of individuals who may seek to employ the programs' graduates, especially regarding the role of students' SAEs and their job preparedness?

Purpose and Objectives

The purpose of this study was to describe the perceptions of a select group of agricultural professionals regarding the entry-level technical skills they expected students to learn through their participation in the SAE component of secondary agricultural education in [state]. A modified Delphi technique was used to achieve this purpose.

1. Describe selected personal and professional characteristics of agricultural industry experts who comprised the study's Delphi panel.
2. Describe the perceptions of panelists regarding the SAE component of the secondary agricultural education model as related to the technical skill acquisition of students preparing for entry-level positions in the agricultural industry in [State], using the seven career pathways as an exploratory framework.
3. Suggest career pathways in which students should learn entry-level skills through participation in SAEs such that their job preparedness on entering the agricultural industry in [State] is enhanced. Accordingly, Roberts' and Ball's (2009) content-based model for teaching agriculture would be expanded regarding its' relevance to students' SAEs.

Methods and Procedures

This was a descriptive study that employed a survey research design using the Delphi technique (Sackman, 1975). The Delphi technique is a widely accepted method for achieving convergence of opinion concerning real-world knowledge solicited from experts in certain topic areas (Hsu & Sandford, 2007). Linstone and Turoff (1975) characterized the Delphi technique as a communication process that is structured to produce a detailed examination of a topic/problem and discussion from the participating group (i.e., expert panel), but not one that forces a quick compromise. The purpose of the Delphi technique is to gather responses from an expert panel or panels and combine the responses into one useful statement or "position" (Stitt-Gohdes & Crews, 2004). In agricultural education, the Delphi technique has been accorded a reasonable degree of acceptance; e.g., the technique has been used in the area of curriculum planning and the identification of personal qualities of student leaders (Martin & Frick, 1998).

Purposeful sampling was used to select members for the study's expert panel. Creswell defined purposeful sampling as "a qualitative sampling procedure in which researchers intentionally select individuals and sites to learn or understand the central phenomenon" (p. 359). This design allows for development of consensus on a number of issues without face-to-face confrontation (Helmer, 1966). According to Dalkey, Rourke, Lewis, and Snyder (1972), when a Delphi panel has at least 15 members and is truly representative of the expert community, the method is reliable. For this study, a panel of state experts, representing the agricultural industry in [State], was used.

The panel was comprised of experts (i.e., panelists) representing agricultural cooperatives, livestock production, livestock marketing, small grain production, small grain marketing, as well as other ancillary agribusiness entities in [State]. All panelists were familiar with the entry-level technical skills expected for their sector of the agricultural industry. They either were or had been responsible for hiring entry-level employees. In addition, selected panelists were business and industry sponsors of the [State] FFA Proficiency Award program. So, the panel included commodity groups as well as other agricultural sector leaders who represented the seven career pathways for agricultural education in [State] (Table 1). The career pathways for AFNR (referred to as Agricultural Education in [State]) include 1) Food Products and Processing (FPP), 2) Plant and Soil Science (PSS), 3) Animal Science (ANSI), 4) Agricultural Power, Structures and Technology (APST), 5) Agribusiness and Management (AGBMGT), 6) Agricultural Communications (AGCM), and 7) Natural Resources and Environmental Science (NRES) (XDCTE, 2009).

Table 1
Composition of the Study's Delphi Panel: Agricultural Industry Representation by Career Pathways

Industry Sectors	Career Pathways
Dairy Production	Food Products and Processing
Creamery (Dairy Processing)	Food Products and Processing
Retail Greenhouse	Plant and Soil Science
Small Grain Commodity Group	Plant and Soil Science
Livestock Market	Animal Science
Corporate Swine Farm	Animal Science
Livestock Association	Animal Science
Implement Dealership	Agricultural Power, Structures and Technology
Agricultural Lending Association	Agribusiness and Management
Electric Cooperatives	Agricultural Communications
Farm Cooperatives	Agricultural Communications
Soil and Water Conservation Service	Natural Resources and Environmental Science

Agricultural education faculty members at [State] State University established both content and face validity for the initial instrument used in this study. One of the original researchers who developed the Delphi technique, i.e., Dalkey (1969), stated that reliability of .7 or greater could be achieved when the expert panel consisted of 11 members or more. After further use of the Delphi technique, Dalkey et al. (1972) indicated that a group size of 13 was needed for reliability with a correlation coefficient of .9. Therefore, Dalkey et al. recommended a group size of twelve to fifteen panelists. The initial inclusion of 17 industry experts as panelists contributed to the reliability of the multiple round, modified Delphi procedure used in this study.

Personal and professional characteristics unique to the panel of experts were collected: gender, age, years of professional experience, and highest degree earned. Regarding SAEs (or similar 4-H projects), their types, intensity of involvement, and panelists' perceptions of benefits to themselves was also of interest to the researcher. In all, eight items were asked regarding panelists' characteristics. Using the seven career pathways for agricultural education in [State] as a context, panelists were asked to identify entry-level technical skills that should be learned through student participation in the SAE component of secondary agricultural education. In addition, the following explanatory paragraph was included on the round one instrument for the agricultural industry panelists.

> The [State] Department of Career and Technology Education defines SAE programs as teacher-supervised, individualized, hands-on, student developed projects that give students real-world experience in agriculture and/or agriculture related areas (XDCTE, 2009). The seven career pathways for [State] Agricultural Education include 1) Food Products and Processing, 2) Plant and Soil Science, 3) Animal Science, 4) Agricultural Power, Structures and Technology, 5) Agribusiness and Management, 6) Agricultural Communications, and 7) Natural Resources and Environmental Science. Please, focus only on the career pathways that best fit your area of industry expertise and, please, list as many skills as you can. (Ramsey, 2009, p. 57)

Electronic "reminder" messages were sent to panelists approximately one week prior to the assigned due date encouraging the return of round one responses. From round one, 140 statements (n = 12; 70.5% response rate) were provided by the Delphi panelists. The researcher analyzed each statement. Similar or duplicate statements (i.e., skills) were combined or eliminated while compound statements were separated (Shinn, Wingenbach, Briers, Lindner, & Baker, 2009). From 140 original statements, the researcher retained 105 for presentation in round two.

Round Two

The round two instrument asked panelists to rate their level of agreement on the retained entry-level technical skills from round one. All panelists were asked to respond to the 105 statements presented in round two. Panelists were asked to use a six-point response scale to rate the skills: "1" = "Strongly Disagree," "2" = "Disagree," "3" = "Slightly Disagree," "4" = "Slightly Agree," "5" = "Agree," and "6" = "Strongly Agree" (Jenkins; Shinn et al.). Electronic "reminder" messages were sent to panelists approximately one week prior to the assigned due date encouraging the return of round two responses. Some preliminary consensus began to form in round two. Fifty-four skills (n = 12; 70.5% response rate) received a score of "5" or "6" by 75% or more of the respondents and were considered skills for which consensus was reached (Jenkins, 2009; Shinn et al., 2009). Moreover, 24 skills, for which less than 51% of the respondents scored the item a "5" or "6," were removed from further investigation (Hsu & Sandford, 2007; Jenkins).

Round Three

Buriak and Shinn (1989) described the third round of a Delphi study as developing consensus. Accordingly, the third round instrument of this study focused on developing consensus for the 27 skills that remained. The panelists were asked to rate their level of agreement for those skills that at least 51% but less than 75% of panelists had selected "Agree" or "Strongly Agree" in round two. The round three instrument included the percentage of panelists who indicated "5" ("Agree") or "6" ("Strongly Agree") for that skill in round two. Electronic "reminder" messages were sent to panelists approximately one week prior to the assigned due date encouraging the return of round three responses. Compared to the previous round, only a slight increase in the degree of "consensus of agreement" was expected (Anglin, 1991; Dalkey et al., 1972; Jacobs, 1996; Weaver, 1971). Accordingly, six skills received a score of "5" ("Agree") or "6" ("Strongly Agree") by 75% or more of the respondents and were considered skills for which consensus was reached. The remaining skill items failed to reach the established level of agreement for consensus.

Nominal data, i.e., personal and professional characteristics of the Delphi panelists, were analyzed using frequencies and percentages. For each skill item in rounds two and three, the frequency distribution valid percentage was used to determine if the item reached consensus (i.e., ≥ 75% of the panelists indicated "Agree" or "Strongly Agree") (Buriak & Shinn, 1989).

Findings

Of the 12 panelists who completed the round one instrument, 83.4% were male and 16.6% female. Eight of 12 (66.7%) panelists reported their age to be between 20 and 49 years of age. Four of the 12 (33.4%) panelists reported being 50 years or older. Regarding ethnicity or race, 83.4% of the panelists reported they were Caucasian, and 16.6% were Native American. Two-thirds of the panelists reported a bachelor's degree as the highest educational degree earned, 25.0% of panelists held a master's degree, and 8.4% reported high school as their highest level of education. All of the agricultural industry panelists indicated "Full-time employment" in agriculture.

Panelists reported a range of involvement in agricultural youth organizations. Seventy-five percent indicated involvement in FFA. Other youth organizations in which panelists reported involvement included 4-H (16.7%) and "Other" (e.g., [State] Junior Cattleman's Association), 8.3%. Five or more years of participation was reported by 75.1% of panelists. The remaining panelists reported four, three and two years of participation in an agricultural youth organization. More than 80% of the panelists indicated they were "very involved" in an agricultural youth organization, 8.3% reported "somewhat involved," and 8.3% reported "no involvement."

In addition, more than 80% of panelists indicated participation in an SAE/4-H project; the remainder reported no participation. The SAE/4-H projects in which panelists participated included "exhibited livestock" (83.4%), "worked in an agriculturally related job" (58.3%), "raised livestock" (83.4%), and "raised crops" (50.0%). When asked if participation in SAE/4-H projects led to entry-level technical skill acquisition, eight of 12 (66.7%) panelists reported "yes" and four (33.3%) indicated "no."

Round One Findings: Entry-level Technical Skills

The 140 skills provided by agricultural industry experts in round one ranged from "Hygiene" to "Bread Making." The number of skills identified by pathway were Food Products and Processing (FPP, 13), Plant and Soil Science (PSS, 16), Animal Science (ANSI, 37), Agricultural Power, Structures and Technology (APST, 12), Agribusiness and Management (AGBMGT, 6), Agricultural Communications (AGCM, 19), and Natural Resources and Environmental Science (NRES, 2). Following Shinn et al. (2009) recommendation regarding duplicate and compound statements, 105 items were retained for presentation to the Delphi panel in round two.

Round Two Findings: Entry-level Technical Skills
In round two, the panelists were asked to rate their level of agreement on 105 entry-level technical skills. The number of items reaching "consensus of agreement" (i.e., ≥ 75 % indicated "Agree" or "Strongly Agree"), by pathway, were FPP, 2; PSS, 5; ANSI, 29; APST, 2; AGBMGT, 3; AGCM, 13. No skill items from the NRES pathway reached "consensus of agreement" in round two of the study. In total, 54 items reached the level of agreement described.

Round Three Findings: Entry-level Technical Skills
The panelists were asked to rate their level of agreement on 27 entry-level technical skills in round three. The number of additional items reaching "consensus of agreement," by pathway, were FPP, 1; PSS, 1; ANSI, 2; APST, 2. Overall, six additional skill items reached agreement in round three.

The total number of entry-level technical skills that reached "consensus of agreement" was 60. The distribution of entry-level technical skills by career pathway was AGBMGT, 3; AGCM, 13; ANSI, 31; APST, 4; FPP, 3; PSS, 6 (Table 2).

Table 2
Entry-level Technical Skills Students Should Learn through Their Participation in SAEs that reached "Consensus of Agreement" after Three Rounds of the Modified Delphi Study (N = 60)

Entry-level Technical Skills	Career Pathway	% Agreement
Balance sheets	AGBMGT	92.30
Assets and liabilities	AGBMGT	84.60
Simple interest	AGBMGT	84.60
Total Number of Skills for the Pathway	3	
Dependability	AGCM	100.00
Reliability	AGCM	100.00
Trust	AGCM	100.00
Speaking (oral communication)	AGCM	100.00
Self-motivation	AGCM	100.00
Loyalty	AGCM	100.00
Consistency	AGCM	100.00
Determination	AGCM	100.00
Confidence	AGCM	100.00
Organization	AGCM	100.00
Commitment	AGCM	100.00
Team-player	AGCM	84.60
Writing letters to elected, appointed, and career officials	AGCM	76.90

Entry-level Technical Skills	Career Pathway	% Agreement
Total Number of Skills for the Pathway	13	
People skills	ANSI	100.00
Know proper terminology regarding gender (livestock)	ANSI	100.00
Animal health	ANSI	100.00
Basic math	ANSI	100.00
Different classes of livestock	ANSI	100.00
Balancing a checkbook	ANSI	92.30
Basic first aid	ANSI	92.30
Proper vaccination sites	ANSI	92.30
Safety awareness	ANSI	92.30
Basic animal nutrition	ANSI	92.30
Basic livestock anatomy	ANSI	92.30
Marketplace sale trends	ANSI	92.30
Birthing assistance	ANSI	92.30
State regulations (regarding agriculture)	ANSI	84.60
Handling (livestock)	ANSI	84.60
Budgets	ANSI	84.60
Species of livestock	ANSI	84.60
Vaccination of animals	ANSI	84.60
Inventory	ANSI	84.60
Live animal evaluation	ANSI	84.60
Disease treatment (animals)	ANSI	76.90
Consumer expectations	ANSI	76.90
Animal reproduction	ANSI	76.90
Business math	ANSI	76.90
Animal breeding	ANSI	76.90
Processing of newborns	ANSI	76.90
Bio-security	ANSI	76.90
Identify bloat	ANSI	76.90
Differences between major breeds of livestock	ANSI	76.90
Air quality (animal confinement)	ANSI	83.30
Processing (livestock)	ANSI	75.00
Total Number of Skills for the Pathway	31	
Basic computer skills	APST	76.90
Change a tire	APST	76.90

Entry-level Technical Skills	Career Pathway	% Agreement
Tool identification	APST	75.00
Change oil	APST	75.00
Total Number of Skills for the Pathway	4	
Hygiene (as related to handling food)	FPP	100.00
Food borne pathogens	FPP	84.60
Harvesting (livestock)	FPP	83.30
Total Number of Skills for the Pathway	3	
Plant identification	PSS	84.60
Plant types	PSS	84.60
Marketing (agriculture products)	PSS	76.90
Weed identification	PSS	76.90
No-till (soil preparation)	PSS	76.90
Seed identification	PSS	75.00
Total Number of Skills for the Pathway	6	
Total Number of Skills, all Pathways	60	

Conclusions

Concerning objective one, a majority of agricultural industry panelists, who represented the seven career pathways for agricultural education in [State], were Caucasian males who ranged in age from 20 to 49. A majority of panelists identified FFA as the agricultural youth association in which they were most involved as youth. A majority of panelists reported five or more years of participation in agricultural youth associations; the panelists' predominant level of participation in such associations was "very involved." Eighty-three percent of panelists reported participation in SAEs or 4-H projects as youth. A majority of the SAEs or 4-H projects reported were entrepreneurial. A majority of panelists identified that their participation in SAEs or 4-H projects had led to the acquisition of entry-level technical skills.

Regarding objective two, the expert panelists reached "consensus of agreement" on 60 entry-level technical skills that should be learned through students participating in supervised agricultural experiences (Table 2). So, it was concluded that students' acquisition of these technical skills could facilitate their preparation for entry-level positions in the agricultural industry. The agricultural industry panelists reached "consensus of agreement" on the highest number of entry-level technical skills from two career pathways: Animal Science (31) and Agricultural Communications (13) (Table 2). Accordingly, it was concluded that, based on the panelists' perceptions, SAEs held the most potential for students acquiring entry-level technical skills related to these career pathways.

As for objective three, this study identified the career pathways that selected industry experts perceived as having the largest number of entry-level technical skills that should be learned by students who participate in the SAE component of secondary agricultural education in [State]. These findings support Roberts' and Ball's (2009) content-based model of teaching agricultural education and expand its relevance to SAE. Specifically, the identification of entry-level technical skills per the seven career pathways for the AFNR career cluster informs the *Agricultural Instruction and Skill Acquisition* component of the model proffered by Roberts and Ball (Figure 1).

Recommendations

Recommendations for Future Research

Pals (1988) reported that employers recognized the benefits of SAE to students. Results of this study supports Pals' conclusion. However, inquiries should be conducted to determine the appropriate role of industry participation in the SAE component of the secondary agricultural education program in [State]. Continued investigation of agricultural industry representatives' perceptions regarding the SAE component of the secondary agricultural education model is needed. For example, what are industry representatives' views on how best they could collaborate with secondary agricultural teachers regarding planning and facilitating students' SAEs such that opportunities for learning entry-level technical skills are optimized (e.g., through worksite placements)? Moreover, how are agricultural industry experts being used by secondary agricultural education teachers currently (e.g., as advisory group members) to inform the relevance of their programs better, including students' SAEs? Concomitantly, what is the role of the agricultural industry in [State] regarding state-level decision making on the direction and future of secondary agricultural education, including significant programmatic aspects such as students' supervised agricultural experiences?

The career pathways of ANSI and AGCM were identified as having the most potential for entry-level skill acquisition through students' participation in SAEs. Conversely, experts identified fewer skills in the pathways of FPP, AGBMGT, APST, and PSS as having potential to be learned through SAEs. Accordingly, additional study is needed to understand more clearly the potential for skill acquisition in these pathways through student participation in SAE. The absence of any entry-level technical skills representing the NRES career pathway reaching "consensus of agreement" may reflect the panel's composition (Table 1); i.e., only one expert represented that career pathway. Two skills from this pathway were identified during round one of the study but they failed to reach sufficient consensus in round two to be carried forward. Further investigation should be conducted regarding this career pathway and its relationship to students' SAEs, especially due to the escalating imperatives of environmental sustainability and "green collar" jobs.

Recommendations for Future Practice

Teacher educators of agricultural education should make the Agriculture, Food, and Natural Resources Career Cluster and the representative career pathways more transparent to pre-service students during their teacher preparation program. The integration of SAE opportunities throughout the seven career pathways and the link that exists between agricultural industry representatives' views and expectations (i.e., potential employers) and the entry-level technical skill acquisition of secondary agricultural education students should be emphasized.

State staff who are responsible for the secondary agricultural education program should consider facilitating externship opportunities that allow teachers to experience industry environments and expectations for entry-level workers. According to Luft (1999), externships help teachers make their instruction more relevant in preparing students for the world of work. Work-based learning experiences are important for teachers as well as students enrolled in agricultural education. Teachers could use contextual examples from their externship experiences when planning, facilitating, and assessing students' SAEs.

Teacher attitudes and expectations influence student participation in SAEs (Dyer & Osborne, 1995). Camp, Clark, and Fallon (2000) reported that SAE, as structured then, was a vital component of a comprehensive program of secondary agricultural education. This study found that selected agricultural industry experts perceived students should learn entry-level technical skills related to their employability in the agricultural industry through SAEs, especially for the career pathways Animal Science and Agricultural Communications. So, teachers, teacher educators, and state program leaders should continue to facilitate and promote the SAE component of secondary agricultural education. In particular, teachers should consider increasing their collaboration with industry partners to provide worksite placement opportunities for students (National Council for Agricultural Education, 1992).

Discussion and Implications

Phipps et al. (2008) described the purpose of agricultural education as preparing people for entry or advancement in agricultural occupations and professions, job creation, and agricultural literacy. The National FFA Organization reported that more than 300 career opportunities in the agricultural science, food, fiber, and natural resources industry exist (2008-2009 Official FFA Manual). A comprehensive program model consisting of classroom and laboratory instruction, FFA, and supervised agricultural experience is used to deliver experiential learning opportunities to students enrolled in secondary agricultural education (Dyers & Osborne, 1995; Roberts & Ball, 2009, Talbert et al., 2007).

This study supports using the SAE component of secondary agricultural education to assist students in learning entry-level technical skills. However, not all career pathways were viewed by the study's Delphi panelists as holding or promoting a substantial number of entry-level technical skills, (i.e., Food Products and Processing, Plant and Soil Science, Agricultural Power, Structures and Technology, Agribusiness and Management, and Natural Resources and Environmental Science).

Moreover, the [State] Governor's Council for Workforce and Economic Development (GCWED, 2005) report, *Understanding the Knowledge and Skill Gaps Impacting the State's Key Industry Sectors*, identified the agriculture and food-processing sector as one of six targeted industries that were at risk. This sector includes the production of agricultural products, animal food manufacturing, dairy product manufacturing, animal processing, beverage manufacturing, industrial machine manufacturing, and numerous other enterprises. Per the report, "at risk" meant those critically important industry sectors that would experience gaps in availability of workers with the necessary technical skills needed to sustain the industry in [State].

Manufacturing is one of the top five industries in [State] that account for two-thirds of the state's jobs. [State's] manufacturing industry is driven by processed meat, tire manufacturing, oil and gas field machinery and equipment, air conditioning and heating equipment, and poultry processing (GCWED). Moreover, of the top 10 agricultural knowledge requirements, "Mechanical" and "Food Production" were identified as the first and second knowledge items needed in the agriculture and food processing industry in [State] (GCWED). To that end, the findings of this study are incongruent or "imbalanced" with the needs identified by the GCWED report. Industry experts reached "consensus of agreement" on only three entry-level technical skills for the Food Products and Processing pathway and four skills in the career pathway Agricultural Power, Structures and Technology. These are career pathways that could prepare students for entry-level positions in the Mechanical and Food Production sectors of the agriculture and food processing industry in [State].

In addition, an *Occupational Outlook Quarterly* report (U.S. Department of Labor, 2006) identified occupations and their viability from 2004 through 2014. The pathways of Food Products and Processing and Agribusiness and Management (three skills identified, respectively) will show "average growth" in the time frame represented by the report. Therefore, jobs are available and could provide future opportunities for students seeking entry-level employment in those areas either during high school (e.g., worksite placement SAEs) or after graduation. So, change may be needed to ensure that more students participate in SAEs that present them with opportunities to learn job skills in those occupational areas.

This study identified entry-level technical skills that industry experts perceived should be learned through the SAE component of the secondary agricultural education model. Accordingly, Roberts and Ball (2009) proffered a content-based model for teaching agriculture (Figure 1) relying on industry-relevant instruction that results in observable skill acquisition by students. But how should in-service teachers acquire industry-relevant content knowledge and skills so they, in turn, can facilitate SAEs such that their students learn and practice entry-level technical skills sufficiently? Is Luft's (1999) view on "externships" an appropriate answer? What may be other methods or approaches? These questions require further study and dialogue by agricultural education professionals.

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Professional Development Needs Related to Agricultural Mechanics Laboratory Management for Agricultural Education Student Teachers in Texas

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Abstract

Skills needed to manage an agricultural mechanics laboratory are essential knowledge for all school-based agriculture teachers who instruct students in an agricultural mechanics laboratory (Bear & Hoerner, 1986). This research investigated the agricultural mechanics laboratory management professional development needs of Texas school-based agricultural education student teachers. Data were collected with a mailed questionnaire designed to determine the student teachers' perceptions of the importance of 70 selected agricultural mechanics laboratory management competencies and their self-assessed ability to perform those competencies. The Borich (1980) Needs Assessment Model was used to assess and evaluate the professional development needs of the teachers. The study found that Texas school-based agricultural education student teachers were in need of agricultural mechanics laboratory management professional development education in the areas of: laboratory equipment diagnosis and repair, first aid, and safe disposal of hazardous materials. As a result of these findings, the researchers recommend that Texas teacher educators, state agricultural education supervisory staff, and local professional development coordinators provide pertinent and continuous professional development education for Texas school-based agricultural educators in the area of agricultural mechanics laboratory management through technical workshops, professional development conferences and university instructed agricultural mechanics courses.

Introduction and Literature Review

The use of school and community laboratories, where students employ learning by doing, is an integral part of many agricultural education programs (Sutphin, 1984). According to Phipps and Osborne (1988), a total school-based agricultural education program consists of three essential and interdependent components. Specifically, these components are: classroom and laboratory instruction; independent experiential learning, commonly known as Supervised Agricultural Experience (SAE); and participation in the student leadership organization, specifically the National FFA Organization. Specialized facilities are often an integral element used for each of these three components to further enrich student learning experiences (McKim, Saucier, & Reynolds, 2010).

Hubert, Ullrich, Lindner, and Murphy (2003) stated "agricultural education programs offer many unique hands-on opportunities for students to develop both valuable academic and vocational skills" (p. 1). This assertion is especially true for the instructional area of agricultural mechanics. In 1988, Phipps and Osborne proposed that the primary objective of agricultural mechanics education is the development of the abilities necessary to perform the mechanical activities to be done in agriculture. The instruction of the abilities, or skills, used in agricultural mechanics is often conducted in school-based laboratories.

Laboratories are essential educational tools for agricultural mechanics programs. Much of the instruction of agricultural mechanics information takes place in the laboratory setting (Johnson & Schumacher, 1989). Phipps and Osborne (1988) estimated that up to 40% of the instructional time in many agricultural education programs involves agricultural mechanics education. Shinn (1987) reported that up to two-thirds of the total instructional time in many agricultural education programs was devoted to laboratory instruction. As such, a great deal of instructional time is spent in the agricultural mechanics laboratory and is essential to maximizing student learning (Bear & Hoerner, 1986). With the amount of instructional time being spent in agricultural mechanics laboratories across the U.S., it is critical that agriculture teachers receive agricultural mechanics laboratory management education (Harper, 1984; McKim et al., 2010; Saucier, Schumacher, Funkenbusch, Terry, & Johnson, 2008).

Knowledge and skills associated with agricultural mechanics laboratory management are essential for agricultural educators who intend to provide a safe and efficient laboratory learning environment for agricultural mechanics students (McMahon, 1975; Saucier et al., 2008; Strong, 1975). Harper (1984) pointed out that students are more safety conscious if teachers also follow proper safety practices, demonstrate accurate safety knowledge, provide a safe laboratory environment, convey a positive safety attitude, and relay safety expectations to the students. Several studies noted that school-based agricultural educators do not receive adequate laboratory safety education prior to beginning their teaching careers or after accepting a teaching position (Dyer & Andreasen, 1999; Forsythe, 1983; Foster, 1986; Jarrett, 1967; Rosencrans, 1996; Swan, 1992). Barrick and Powell (1986) found that first year agriculture teachers rated managing laboratory learning as a highly important ability for agriculture teachers; however, their level of knowledge concerning the management of laboratory learning was low.

In 1990, Johnson, Schumacher, and Stewart concluded that Missouri school-based agriculture teachers had professional development needs in the area of agricultural mechanics laboratory management and had the greatest professional development needs in the area of safety. In a similar study conducted in Nebraska, Schlautman and Silletto (1992) found that Nebraska school-based agriculture teachers had professional development needs in the area of agricultural mechanics laboratory management safety and policy implementation. Fletcher and Miller (1995) found similar results in their study conducted in Louisiana, where they reported agriculture teachers were not using recommended safety practices or providing student safety and emergency equipment to the extent warranted by the hazards found in the agricultural mechanics laboratories. Most recently, Saucier, Terry, and Schumacher (2009) found that Missouri school-based agriculture teachers, who were responsible for managing agricultural mechanics laboratories, had professional development education needs in the areas of: maintaining and repairing agricultural mechanics laboratory tools and equipment, maintaining a safe agricultural mechanics laboratory, and storing, handling and disposing of hazardous materials.

Purpose and Research Questions

Agricultural mechanics courses continue to be one of the most popular and frequently offered school-based agricultural education courses in Texas (TEA, 2009). However, a study to determine the competence and professional development educational needs of Texas school-based agricultural education student teachers has never been conducted. Therefore, the purpose of this study was to determine the professional development needs of agricultural education student teachers in Texas, who one day, will be responsible for managing an agricultural mechanics laboratory. The following research questions were investigated to accomplish this purpose:

1. What are the personal and professional characteristics of school-based agricultural education student teachers in Texas?
2. What are the professional development education needs of agricultural education student teachers in Texas, as related to selected competencies of agricultural mechanics laboratory management?

Procedures

This quantitative descriptive study measured the perceptions and abilities of school-based agricultural education student teachers in Texas regarding agricultural mechanics laboratory management competencies. The target population for this study was all Texas student teachers who completed an agricultural science teacher certification program during the spring of 2009. Names of the population were obtained by contacting the agricultural education faculty member in charge of the pre-service teacher education program at each of the 10 certifying institutions within Texas. The frame included 98 students from nine institutions that completed a school-based agricultural education student teaching practicum in Texas during the spring of 2009. A census (N = 98) was taken to more accurately describe the characteristics of the population and eliminate potential errors associated with subject selection and sampling.

The *Agricultural Mechanics Laboratory Management Competencies Instrument* developed by Johnson, Schumacher, and Stewart (1990) served as the data collection instrument for this study as modified by Saucier, Terry, and Schumacher (2009). The first section, of the two part instrument, consisted of a double-matrix containing 70 statements representing agricultural mechanics laboratory management competencies. The nature of the double-matrix allowed subjects to respond to each statement twice on a 5-point Likert-type scale, once rating the perceived importance of each competency and once rating the individual’s ability to perform each competency. The second section sought to identify selected personal and professional demographic characteristics of the subjects such as: age, gender, and agricultural mechanics experience.

Johnson and Schumacher’s (1989) data collection instrument included 50 competencies that were developed with input from a national panel of agricultural mechanics education experts through a modified Delphi technique and was reported to be valid. In 1990, Johnson et al. added a five-point Likert-type scale with a double-matrix format to Johnson and Schumacher’s (1989) instrument to determine if discrepancies existed between the perceived importance of each competency and the perceived ability of the individual to perform each competency. A later study conducted by Saucier, et al. (2009), expanded Johnson, Schumacher, and Stewart’s 50-competency double-matrix instrument to 70 competencies by splitting multiple-component competencies into single-component competencies. Additionally, Saucier et al. reported their revised instrument to include five constructs: laboratory and equipment maintenance; laboratory teaching; program management; tool, equipment, and supply management; and laboratory safety.

Dillman's (2007) data collection protocol served as the guide for the design and format of the data collection instrument used in this study. The booklet-type, paper questionnaire was distributed to a panel of experts to assess face validity. The panel of eight experts consisted of faculty members from two Land-Grant Universities; all of whom are considered experts in the areas of agricultural education, instrument development, and research methodology. Content validity of the instrument was assessed in a previous study (Saucier, et al., 2009) and was determined to be valid by a panel of experts. Because this study used the same competencies previously determined to be valid in the study conducted by Saucier et al. (2009), the constructs were considered to be valid.

Reliability for the data collection instrument was determined by conducting a pilot test. A census was taken of all school-based agricultural education student teachers who completed a school-based agricultural education student teaching practicum at four Texas universities during the fall of 2008 (N = 34). Cronbach's alpha coefficients were calculated for the scales (importance and ability), yielding coefficients of .98 and .99 (N = 34) respectively. The Cronbach's alpha coefficients for the five constructs (Saucier, et al., 2009) included: laboratory and equipment maintenance; laboratory teaching; program management; tool, equipment, and supply management; and laboratory safety and ranged from .86 to .94 (N = 34).

Questionnaires were distributed to school-based agricultural education student teachers, at the conclusion of the spring 2009 semester, by the agricultural education faculty member in charge of teacher pre-service at eight of the nine certifying institutions within Texas. Due to scheduling issues at one university, questionnaires were mailed directly to the subjects after making initial contact with each of them by telephone or e-mail. All other completed questionnaires were returned, in bulk, by the agricultural education faculty member in charge of student teaching at the other seven institutions that received questionnaires. Due to the bulk return of the instruments by each institution, procedures for addressing nonresponse bias were not practical; thus, no additional efforts were made to address nonresponse bias. Therefore, the findings of this study are limited to those individuals who responded. A final response rate of 58.16% (n = 57) was obtained.

Data were analyzed using SPSS version 17.0. Research question one sought to investigate the personal and professional characteristics of school-based agricultural education student teachers in Texas; therefore, descriptive statistics were reported. The Borich (1980) Needs Assessment Model was used to determine where discrepancies existed for objective two. A mean weighted discrepancy score (MWDS) was calculated for each competency using the following steps: A discrepancy score was determined by taking the importance rating minus the ability rating for each respondent on each competency. A weighted discrepancy score was then calculated by multiplying each discrepancy score by the associated mean importance rating. Lastly, a mean weighted discrepancy score was calculated by taking the sum of the weighted discrepancy scores for each competency and dividing it by the number of respondents. Competencies were separated by construct, and then ranked from high to low, using the MWDS—competencies with highest MWDS indicate areas in need of the most improvement.

Findings

Of the 57 respondents, 31 were female (55.40%). The age of the Texas agricultural education student teachers ranged from 21 to 48 years, with an median age of 22.00 (*Mean* = 24.04; *Mode* = 22.00; *SD* = 4.86). Twenty-eight respondents (49.81%) were from a community of less than 10,000 residents. Respondents also indicated that they were members of 4-H (*n* = 22; 38.60%) and the National FFA Organization (*n* = 49; 87.50%) during their youth. A third of the respondents (*n* = 19; 33.30%) had participated in an agricultural mechanics related Supervised Agricultural Experience as a youth as well. Furthermore, the average student teacher had completed 9.69 (*SD* = 4.15) university semester credit hours in agricultural mechanics coursework. Forty (26.70%) of the student teachers were pursuing a bachelor's degree; whereas, 16 (28.10%) were pursuing a master's degree. Twenty-four (42.10%) respondents were pursuing a teaching certificate as undergraduates; whereas, 32 (56.10%) were pursuing post-baccalaureate certification. Major and minor areas of study for these teachers are reported in Table 1.

Table 1
Areas of study for school-based agricultural education student teachers in Texas

Characteristic	*f*	%
Major area of study in college (*n* = 57)		
Agricultural Education	37	64.90
Agricultural Business	4	7.00
Animal Science	4	7.00
No response	4	7.00
Other	3	5.30
Agricultural Mechanics	2	3.50
Agricultural Economics	1	1.80
Animal Nutrition	1	1.80
Horticulture	1	1.80
Minor area of study in college (*n* = 21)		
Agricultural Education	7	33.30
Other	6	28.60
Animal Science	3	14.30
Plant Science	2	9.50
Agronomy	1	4.80
Horticulture	1	4.80
Range Management	1	4.80

Table 2 displays the agricultural mechanics laboratory management constructs listed from highest to lowest MWDS. Laboratory and Equipment Maintenance was the construct with the highest MWDS. Saucier et al. (2009) defined Laboratory and Equipment Maintenance (see Table 3) as "all maintenance activities that an agriculture teacher must perform to keep the laboratory and equipment in working order" (p. 183). Laboratory Safety (see Table 4) was defined as "all activities that an agriculture teacher must perform to maintain a safe laboratory learning environment" (p. 184). Laboratory Teaching (see Table 5) was defined as "all educational activities that are conducted in the laboratory by the agriculture teacher to ensure academic and vocational success" (p.185). Program Management (see Table 6) was defined as "all activities that are conducted by the agriculture teacher to plan, guide, assess, and evaluate the agricultural mechanics program" (p. 186). Tool, Equipment, and Supply Management (see Table 7) was the construct with the lowest MWDS, and therefore has the least need of professional development education. Saucier et al. (2009) defined Tool, Equipment, and Supply Management as "all activities that are conducted by the agriculture teacher to ensure that all tools, equipment, and supplies are secured and in proper quality and quantity to facilitate the learning process" (p. 186).

Table 2
Competency Constructs Ranked by $\bar{x}_{\text{MWDS}}$

Rank	Competency Construct	$\bar{x}_{\text{MWDS}}$
1	Laboratory and Equipment Maintenance	2.61
1	Laboratory Safety	2.61
3	Laboratory Teaching	1.80
4	Program Management	1.53
5	Tool, Equipment, and Supply Management	1.52

Table 3
Mean Weighted Discrepancy Scores for Competencies Related to the Laboratory and Equipment Maintenance Construct (n = 57)

			Importance			Ability		
Rank	Competency	MWDS	*M*	*SD*	Mode	*M*	*SD*	Mode
1	Diagnosing malfunctioning agricultural mechanics lab equipment.	5.31	4.34	0.79	5	3.12	0.82	3
2	Making major agricultural mechanics lab equipment repairs.	4.77	4.47	0.73	5	3.40	1.18	3
5	Modifying facilities to accommodate students with disabilities.	3.29	4.43	0.73	5	3.69	1.05	3
9	Modifying equipment to accommodate students with disabilities.	3.01	4.36	0.72	5	3.67	1.07	3
10	Developing a maintenance schedule for agriculture mechanics equipment.	2.87	4.38	0.70	5	3.72	0.97	3
19	Utilizing technical manuals to order replacement/repair parts for agricultural mechanics lab equipment.	2.58	4.16	0.81	5	3.53	1.01	3
24	Making minor agricultural mechanics lab equipment repairs.	2.33	4.22	0.75	4	3.67	1.00	4
27	Performing routine maintenance of agricultural mechanics lab equipment (e.g., adjust belt tension, lubricate moving parts, dress grinding wheels.)	2.28	4.28	0.72	4	3.74	1.04	4
32	Developing a procedure to insure proper agricultural mechanics lab clean up.	2.08	4.47	0.66	5	4.00	0.90	4
33	Installing stationary power equipment (e.g., assembling equipment, connecting to a power source, performing preliminary adjustments.)	2.06	3.98	0.83		3.47	1.13	3
36	Making minor repairs to the agricultural mechanics laboratory facility.	1.89	4.05	0.74	4	3.59	1.04	3
37	Constructing welding booths, work benches, storage areas, etc.	1.87	3.95	0.81	4	3.44	1.02	3
40	Developing a file of service/operator manuals for agricultural mechanics lab equipment.	1.77	4.10	0.85	4[a]	3.67	0.91	4
41	Maintaining a file of service/operator manuals for agricultural mechanics lab equipment.	1.75	4.07	0.84	4[a]	3.64	0.85	3
57	Arranging for a professional service person to make major equipment repairs (e.g., replace switches bearings.)	1.25	4.18	0.74	4	3.84	0.97	3
	$\bar{x}_{\text{MWDS}}$for laboratory and equipment maintenance	2.61						

Note [a] Multiple modes exist, the smallest value is shown; Importance Scale: 1 = No Importance, 2 = Below Average Importance, 3 = Average Importance, 4 = Above Average Importance, 5 = Utmost Importance; Ability Scale: 1 = No Ability, 2 = Below Average Ability, 3 = Average Ability, 4 = Above Average Ability, 5 = Exceptional Ability.

Table 4
Mean Weighted Discrepancy Scores for Competencies Related to the Laboratory Safety Construct (n = 57)

			Importance			Ability		
Rank	Competency	MWDS	*M*	*SD*	Mode	*M*	*SD*	Mode
3	Administering first aid.	3.80	4.81	0.44	5	4.02	0.82	4
6	Developing an accident reporting system.	3.24	4.74	0.52	5	4.07	1.18	4[a]
7	Correcting hazardous laboratory conditions.	3.12	4.64	0.61	5	3.97	1.05	4
8	Maintaining the agricultural mechanics laboratory in compliance with OSHA standards.	3.12	4.52	0.66	5	3.83	1.07	4
12	Maintaining healthy environmental conditions in the laboratory.	2.85	4.47	0.66	5	3.83	0.97	4
13	Properly installing and maintaining safety devices and emergency equipment (e.g., fire extinguishers, first aid supplies, machine guards, etc.)	2.85	4.51	0.78	5	3.88	1.01	5
18	Conducting regular safety inspections of the laboratory.	2.58	4.53	0.66	5	3.97	1.00	5
20	Safely handling hazardous materials.	2.55	4.78	0.50	5	4.24	1.04	5
23	Providing students safety instruction.	2.34	4.84	0.45	5	4.36	0.90	5
26	Promoting laboratory safety by color coding equipment/marking safety zones/posting appropriate safety signs and warnings.	2.29	4.43	0.73	5	3.91	1.13	5
29	Documenting student safety instruction.	2.13	4.59	0.65	5	4.13	1.04	4[a]
31	Selecting protective equipment for student use (e.g., safety eyewear.)	2.11	4.71	0.56	5	4.26	1.02	5
35	Maintaining protective equipment for student use (e.g., safety eyewear.)	1.91	4.62	0.56	5	4.21	0.91	5
48	Arranging equipment in the agricultural mechanics lab to enhance safety/ efficiency/learning.	1.58	4.28	0.82	5	3.91	0.85	4
	$\bar{x}_{\text{MWDS}}$for laboratory safety	2.61						

Note. [a] Multiple modes exist, the smallest value is shown; Importance Scale: 1 = No Importance, 2 = Below Average Importance, 3 = Average Importance, 4 = Above Average Importance, 5 = Utmost Importance; Ability Scale: 1 = No Ability, 2 = Below Average Ability, 3 = Average Ability, 4 = Above Average Ability, 5 = Exceptional Ability.

Table 5
Mean Weighted Discrepancy Scores for Competencies Related to the Laboratory Teaching Construct (n = 57)

			Importance			Ability		
Rank	Competency	MWDS	*M*	*SD*	Mode	*M*	*SD*	Mode
11	Enforcing a student discipline policy.	2.87	4.67	0.61	5	4.05	0.85	5
21	Identifying equipment required to teach agricultural mechanics skills.	2.55	4.34	0.64	4	3.76	0.92	4
22	Identifying supplies required to teach agricultural mechanics skills.	2.41	4.24	0.73	4[a]	3.67	0.93	3
30	Developing educational projects/activities for students.	2.12	4.24	0.68	4	3.74	0.98	3[a]
34	Maintaining a student discipline policy.	2.04	4.55	0.68	5	4.10	0.85	5
43	Identifying tools required to teach agricultural mechanics skills.	1.69	4.30	0.71	5	3.86	0.96	3[a]
49	Developing a rotational plan to move students through agricultural mechanics skill areas.	1.46	4.03	0.88	5	3.67	0.83	3
51	Selecting current references/technical manuals.	1.37	3.89	0.82	4	3.52	0.81	3
53	Developing objective criteria for evaluation of student projects activities.	1.31	4.16	0.70	4	3.82	0.85	3
59	Identifying current references/technical manuals.	1.22	3.88	0.85	3	3.53	0.83	3
66	Designating work stations for each skill area (e.g., cold metal, arc welding, small engines, electricity, etc.)	0.80	3.86	0.87	4	3.66	0.76	3[a]
	$\bar{x}_{MWDS}$ for laboratory teaching	1.80						

Note. [a] Multiple modes exist, the smallest value is shown; Importance Scale: 1 = No Importance, 2 = Below Average Importance, 3 = Average Importance, 4 = Above Average Importance, 5 = Utmost Importance; Ability Scale: 1 = No Ability, 2 = Below Average Ability, 3 = Average Ability, 4 = Above Average Ability, 5 = Exceptional Ability.

Table 6

Mean Weighted Discrepancy Scores for Competencies Related to the Program Management Construct (n = 57)

			Importance			Ability		
Rank	Competency	MWDS	*M*	*SD*	Mode	*M*	*SD*	Mode
14	Updating agricultural mechanics course offerings.	2.84	3.95	0.81	3[a]	3.23	0.89	3
16	Developing an agricultural mechanics laboratory budget.	2.63	4.36	0.69	5	3.76	0.98	3
17	Developing a written statement of agricultural mechanics lab policies/ procedures.	2.59	4.41	0.65	5	3..83	0.90	4
28	Operating within the constraints of an agricultural mechanics budget.	2.21	4.28	0.70	4	3.76	0.92	3
38	Planning an agricultural mechanics public relations program.	1.80	4.02	0.78	4	3.57	0.88	3
44	Planning student recruitment activities for the agricultural mechanics program.	1.66	4.00	0.86	5	3.59	0.84	4
45	Developing a student discipline policy.	1.63	4.50	0.76	5	4.14	0.89	5
46	Developing computer based lab management reports.	1.63	4.10	0.81	4	3.71	0.96	4
47	Conducting an agricultural mechanics public relations program.	1.60	3.96	0.87	4	3.56	1.07	3
50	Implementing student recruitment activities for the agricultural mechanics program.	1.40	4.05	0.80	4	3.71	0.97	3
55	Maintaining computer based student academic records.	1.31	4.14	0.72	4	3.83	0.88	4
61	Estimating time required for students to complete projects/activities.	0.98	4.07	0.84	4	3.83	0.92	3
62	Maintaining a file of educational projects/activities.	0.90	3.93	0.90	4	3.66	1.00	3
63	Developing a file of educational projects/activities for students.	0.90	3.93	0.90	4	3.67	0.93	3
68	Developing a system to document achievement of student competencies.	0.54	3.95	0.80	4	3.81	0.83	3
70	Developing a procedure to bill students for materials used in project construction.	- 0.19	3.67	0.87	3	3.72	0.77	4
	$\bar{x}_{\text{MWDS}}$for program management	1.53						

Note. [a] Multiple modes exist, the smallest value is shown; Importance Scale: 1 = No Importance, 2 = Below Average Importance, 3 = Average Importance, 4 = Above Average Importance, 5 = Utmost Importance; Ability Scale: 1 = No Ability, 2 = Below Average Ability, 3 = Average Ability, 4 = Above Average Ability, 5 = Exceptional Ability.

Table 7

Mean Weighted Discrepancy Scores for Competencies Related to the Tool, Equipment, and Supply Management Construct (n = 57)

			Importance			Ability		
Rank	Competency	MWDS	*M*	*SD*	Mode	*M*	*SD*	Mode
4	Safely disposing of hazardous materials (e.g., flammables, acids, compressed gas cylinders.)	3.68	4.74	0.52	5	3.97	1.01	5
15	Safely storing hazardous materials.	2.80	4.78	0.56	5	4.19	0.91	5
25	Recognizing characteristics of quality tools/equipment.	2.31	4.19	0.74	4	3.64	0.97	3[a]
39	Equipping work stations for each skill area (e.g., cold metal, arc welding, small engines, electricity, etc.)	1.77	3.95	0.78	4	3.50	0.94	3
42	Preparing bid specifications for equipment/tools/supplies.	1.71	3.89	0.86	4	3.46	0.98	3
52	Developing procedures for efficient storage/distribution of consumable supplies.	1.33	4.07	0.84	4	3.74	0.79	4
54	Storing protective equipment for student use (e.g., safety eyewear.)	1.31	4.47	0.71	5	4.17	0.80	5
56	Developing an adequate inventory of laboratory consumable supplies.	1.25	4.03	0.73	4	3.72	0.93	3
58	Developing procedures to facilitate the storage/checkout/security of tools/equipment.	1.23	4.14	0.79	5	3.79	0.87	3
60	Developing an identification system to deter tool/equipment theft.	1.16	4.21	0.74	4	3.93	0.82	4
64	Ordering equipment/tools/supplies.	0.82	3.91	0.76	4	3.71	0.89	3
65	Conducting shop inventory (e.g., tools/equipment/consumable supplies.)	0.80	4.26	0.69	4	4.07	0.93	4
67	Maintaining an adequate inventory of consumable supplies.	0.77	4.00	0.71	4	3.81	0.83	3
69	Silhouetting tool/ equipment cabinets.	0.32	3.68	0.95	3[a]	3.60	0.98	3
	$\bar{x}_{\text{MWDS}}$ for tool, equipment, and supply management	1.52						

Note. [a] Multiple modes exist. The smallest value is shown. Importance Scale: 1 = No Importance, 2 = Below Average Importance, 3 = Average Importance, 4 = Above Average Importance, 5 = Utmost Importance; Ability Scale: 1 = No Ability, 2 = Below Average Ability, 3 = Average Ability, 4 = Above Average Ability, 5 = Exceptional Ability.

Conclusions, Implications, and Recommendations

The typical school-based agricultural education student teacher in Texas is female, 22 years of age, and from a rural community with less than 10,000 residents. As a youth, she was possibly a member of the National FFA Organization and the Texas 4-H. In addition, she is an agricultural education major and has completed almost 10 university semester credit hours of agricultural mechanics coursework. Most of the student teachers are not currently pursuing a master's degree and are becoming certified to teach while completing their undergraduate degree.

Texas school-based agricultural education student teachers have the greatest professional development education needs in the construct areas of laboratory and equipment maintenance and laboratory safety. These student teachers also have professional development needs in the areas of laboratory teaching, program management, and tool, equipment, and supply management. The five specific agricultural mechanics laboratory management topics in which teachers have the greatest need for professional development education are: diagnosing malfunctioning agricultural mechanics laboratory equipment; making major agricultural mechanics laboratory equipment repairs; administering first aid; safely disposing of hazardous materials (e.g., flammables, acids, compressed gas cylinders); and modifying facilities to accommodate students with disabilities.

Several questions concerning the limitations of this study should also be addressed. Can student teachers, who have minimal experience in the classroom, determine which laboratory management competencies are important? Can student teachers determine their ability to perform select laboratory management competencies? Answers to these questions and others are debatable and grounds for future research.

According to the National Council for Agricultural Education, a research based professional development program will result in "an abundance of fully qualified and highly motivated agricultural educators at all levels" (Osborne, 2007, p.20). Based upon the conclusions of this research, several implications and recommendations must be considered:

1. Interestingly, two of the top five professional development needs identified in this study relate to the diagnosis and repair of laboratory equipment. Why do teachers feel such a need for professional development related to laboratory equipment? Do teacher educator programs adequately prepare beginning teachers to maintain, diagnose, and repair common tools and equipment used to instruct school-based agricultural mechanics curriculum? Have too few agricultural mechanics related professional development programs been offered in recent years for beginning teachers?

2. McMahon (1975) and Strong (1975) suggested that the primary responsibility of the teacher is to provide safety instruction and a safe learning environment for students working in an agricultural education laboratory. However, several studies have indicated that voids exist in teacher preparation programs in the area of laboratory safety (Dyer & Andreasen, 1999; Forsythe, 1983; Foster, 1986; Jarrett, 1967; Rosencrans, 1996; Swan, 1992). Findings of this study have revealed that Texas student teachers have great professional development needs in the area of ensuring student and laboratory safety. If

teaching in a laboratory is one of the fundamental instructional methods used in all aspects of school-based agricultural education (animal science, horticulture, agricultural mechanics, food science, etc.), what efforts are being made by teacher education programs to prepare future teachers for this critical task?

According to recommendations made by the National Council for Agricultural Education, "well designed professional development experiences, based upon teacher career stage, may improve teacher retention and program continuity" (p. 20.). Additionally, "practicing teachers must have continuing access to high quality professional development programs" (Osborne, 2007, p. 20). Acknowledging the work of Osborne and others (Barrick, Ladewig, & Hedges, 1983; Birkenholz & Harbstreit, 1987; Saucier et al., 2008; Saucier et al., 2009; Saucier, Tummons, Terry, & Schumacher, 2010), it is recommended that studies similar to this one be conducted periodically to ensure the continuing education needs of teachers are met. Recognizing that knowledge and technology related to the management of agriculture education laboratories is constantly evolving; the researchers recommend that a comprehensive assessment of professional development needs be conducted every five years.

Due to the potential dangers and hazards that exist in agricultural mechanics laboratories, it is critical that pre-service and professional development education programs be provided for teachers who manage these facilities. Such programs should be offered with frequency and variety and should be delivered in formats and at times that will have the greatest impact upon the largest number of teachers. In addition, the researchers recommend that teacher education programs evaluate the methods used to educate beginning teachers in the areas of agricultural mechanics laboratory management and that professional development opportunities for these novice teachers be offered to them through webinars, winter and summer technical workshops, and through graduate courses offered through one of the many teacher education universities within the state of Texas.

Future research within the realm of agricultural mechanics education should be explored by researchers. In fact, little research has been conducted in this area of instruction over the past 20 years. Agricultural mechanics courses still remain a popular option for many secondary students and thus, require highly qualified agricultural educators who are technically and pedagogically competent. Are teacher education programs across the nation developing teachers competent in the area of agricultural mechanics? Do these programs have competent staff to instruct pre-service teachers in the area of agricultural mechanics? Research should be conducted to answer these questions and determine the skills and pedagogical competencies needed by beginning teachers to instruct agricultural mechanics at the secondary level.

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What Works? A Needs Preassessment for Food Safety Training

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Abstract

This study was conducted as a portion of a USDA-funded study to develop a training program for grocery store employees that specifically work with hot and cold self-service food bars. Data was collected on manager and employee demographics, food safety knowledge, and previous training experiences. Food safety knowledge was measured to obtain a pre-treatment value then compared among demographic variables and past training experiences to determine which training practices were most effective in the past. This information is critical when developing a new training program in order to maximize effectiveness and efficiency by using methods that have worked in the past and avoiding those that did not. Classroom, on-the-job, textbook, video, and web-based training were associated with the best food safety knowledge scores. These modes should be used in the training program to be developed, and that program should satisfy legal requirements for training.

Introduction and Theoretical Framework

Home meal replacement (HMR) was a little-known term not too long ago, but with the convenience-driven market of today's American society, it has become a main stay in the home. Many families purchase ready-to-eat (RTE) foods. HMR is a rapidly growing trend. As the typical American continues to stay busy and only adds more items to the to-do-list, meals are needed much faster and with less consideration and planning. The majority of parents today make their HMR decision right before mealtime due to tight time constraints (Binkley & Ghiselli, 2005; Cassano, 1999). With two income households becoming more prominent in the nation, there is a need for convenient meals to be made readily available to consumers. In the past it took hours to cook dinner, now consumers want meals in less than five minutes (Binkley & Ghiselli, 2005; Cassano, 1999). This drive for convenience is affecting the entire food industry.

More and more families are utilizing HMR, in fact about 20% of households stop by a grocery store or pizza chain on the way home once a week (Binkley & Ghiselli, 2005; Cassano, 1999; Moomaw, 1996). Grocery stores lose revenue with the increase of family budgets being spent on RTE foods. Grocery stores hold less than one fifth of the HMR industry (Cassano, 1999). In response to the HMR trend grocery stores have opened self-service hot and cold food bars. With these self-service bars comes a kitchen where the food is prepared, as well as the staff that makes the dishes and maintains the food bars throughout the day.

There are food safety concerns at many food merchandising establishments. In order to provide safe food, employees need to know how to properly prepare and maintain food for hot and cold bars.

While the food supply in the United States is one of the safest in the world, CDC estimates that each year 76 million cases of foodborne illness occur and more than 300,000 persons are hospitalized and 5,000 die from foodborne illness (Coordinating Center for Infectious Diseases, Centers for Disease Control and Prevention, 2008, para. 1).

In addition to health issues, foodborne illness results in costs estimated to be $7.7-$23 billion per year to those who become ill, the food industry, and the national economy (Council for Agricultural Science and Technology, 1995). Foodborne illness can be prevented through staff that is well-trained in effective food safety plans (Binkley & Ghiselli, 2005). Food safety regulations are laid out by the Food and Drug Administration (FDA) and can be found in the FDA Food Code. These regulations must be abided by to ensure safe consumption for consumers. Food safety is a major issue that is faced by grocery stores and other food retailers. Food workers' improper preparation procedures are the main cause of foodborne illness outbreaks (Green & Selman, 2005). Proper training is needed to allow for grocery store employees to prepare and serve food in a manner that is safe and free of foodborne illness.

Common types of food safety training include classroom instruction with content enhancing videos employed in two widely accepted programs ServSafe and SuperSafeMark® (Food Marketing Institute, 2008a; National Restaurant Association Educational Foundation, 2009). The SuperSafeMark® training session is offered online and in print and material is presented in a format that is easy to read and understand (Food Marketing Institute, 2008a). ServSafe was used in a study to determine barriers to safe food handling in which bad attitudes and the cost of training were identified barriers. Worsfold (2005) found the most common type of training within the food service industry to be on-the-job training due to the low cost and convenience of the method.

Printed references, instructional videos, distance education technology, and interactive computer programs were methods in which food service employees have expressed an interest (Martin, Knabel, & Mendenhall, 1999). "The best approach is to always look for fresh, creative ways to communicate the importance of food handling practices" (Lawn, 2008, p. 114). Lawn identified three methods for achieving this including the following: using different props, graphic association, and spot-the-error techniques. These techniques enhance employee retention of information gained through training.

This study is a portion of an International Center of Food Industry Excellence (ICFIE) project. The project was funded by the U.S. Department of Agriculture to create a training program for the retail food industry. Food safety programs provide the retail food industry with the information it needs to properly protect customers by selling safe food while operating within industry regulations and best practices (Food Marketing Institute, 2008a). This food safety training program will be tailored for the self-service hot and cold food bar department in grocery stores. Once completed, the training program will consist of modules that can be offered in the classroom setting and on the Internet.

This study relates to the National Research Agenda (Osborne, n.d.) initiative to identify appropriate learning systems to be used in nonformal education settings. This study contributes to the above mentioned research priority area by identifying methods used in the past and topics where additional knowledge is needed. The training program to be developed as a result of these findings will increase the safety of the food supply at hot and cold self-service food bars.

In order to effectively structure a training program to ensure that the goals of the program are reached a needs assessment was preformed. Needs assessments were created based on the grounds that people have needs that are not adequately met or addressed (Witkin & Altschuld, 1995). This study was a preassessment of needs, which is the first phase of a needs assessment (Figure 1).

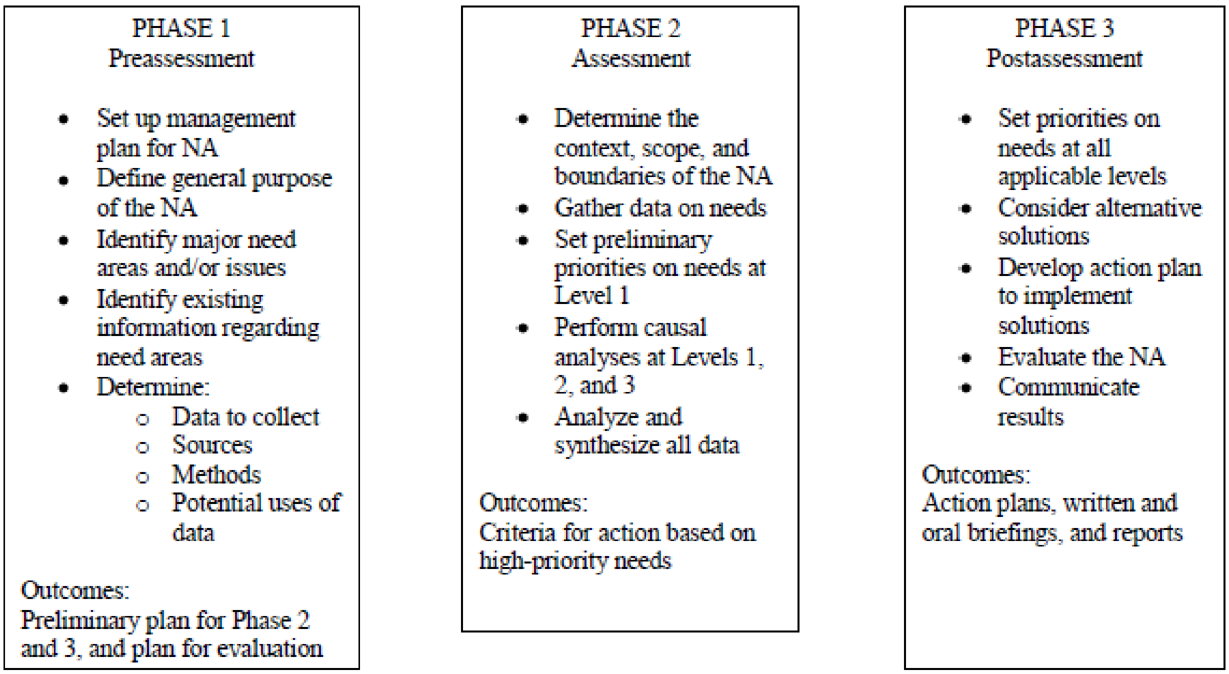

Figure 1. Three-phase plan for needs assessment (Witkin & Altschuld, 1995)

Exploration is another word Witkin and Altschuld (1995) use to describe the first phase of the model, preassessment. In this phase a management plan for the needs assessment is created, the general purpose of the assessment is defined, and known information about the population is identified. Major needs and issues and existing information that can be used to address needs are identified. Data to collect, sources, methods, and potential uses of data are determined in this first phase. Preassessment data collection was the primary purpose of this study. The purpose of the assessment, needs, and sources of data were already partially identified in the grant. The outcome of this phase is primarily planning. Phase 2 and Phase 3 should be planned, as well as an evaluation of the complete needs assessment (Witkin & Altschuld, 1995).

Billions of dollars are spent on training efforts every year (Moskowitz, 2008). Needs assessments can be used to ensure that resources allocated for training efforts are not wasted. Training priorities can be determined through an analysis approach that focuses on employee knowledge, skills, and attitudes. Data should be gathered from employees, managers, and stakeholders on key result areas. Moskowitz (2008) states that best way to collect data for a training needs assessment is through surveys. Employee behaviors can be observed in the field to provide usable data as well. A list of ideal methods, through which tasks are completed by employees, should be developed for a training needs assessment.

Program decisions are made based on information and perceptions of values during a needs assessment (Witkin & Altschuld, 1995). Needs assessments are not focused on individuals; instead they focus on diagnostic information on programs. This information leads to changes in the program which benefit individuals with needs. Needs assessments offer a rational approach for identifying and describing needs, their contributing factors, and criteria and prioritizing those needs.

The primary beneficiaries of the needs assessment are the people who the programs ultimately benefit or who are provided for through the system (Witkin & Altschuld, 1995). For this study, grocery store customers are the primary audience. For needs that can be met through training, programs assessments are most often performed with service providers. This is the case for the needs assessment conducted in this study. Assessments are often performed to meet needs imposed by an emerging technology as is the case with hot and cold self-service food bars.

Purpose and Objectives

The purpose of this study was to conduct a needs preassessment for developing content that should be included in the educational food safety intervention program for hot and cold self-service food bar employees. This particular phase of the study was designed to determine who is working at the self-service food bars in grocery stores, past training those employees have received, and their level of food safety knowledge. The following objectives were derived in order to develop a baseline for self-service food bar employees:

1. Describe managers and employees demographically.
2. Measure manager and employee food safety knowledge.
3. Compare food safety knowledge means among manager and employee demographics.
4. Describe past training experiences for managers and employees.
5. Compare food safety knowledge means among past food safety training experiences.

Methods and Procedures

As stated above, this study was a preassessment of needs for a training program for hot and cold self-service food bars. The intent of this particular portion of the preassessment was to obtain information related to previous types of food safety training the managers and employees who work at these food bars have been exposed to.

The population includes both managers and employees to adequately assess the needs grocery stores have for food safety training. Therefore, the target population included managers and employees of grocery stores that work in the hot and cold food bar department. The non-probabilistic sampling technique used in this study was determined by which stores each of the chains would let the research team access within the geographic locations that were purposively selected and matched within chains by the research team. Therefore, managers and employees from those stores make up the accessible sample. The sampling frame was created by stores for each of these grocery chains.

The sample consisted of employees and managers at 15 purposively selected stores by each chain for participation in the needs preassessment. The number of employees in this department ranged from four to 20 with two to three managers. At least one manager from each store completed the questionnaire, while at some stores two managers participated. Employee participation in this component of the study ranged from two to eight employees from a store. In the sample, 33 managers responded to the questionnaire and 74 employees responded.

The written needs preassessment was developed based on SuperSafeMark®. The SuperSafeMark® certification exam is an accredited, nationally recognized exam that has been customized to meet the unique needs of the retail food industry (Food Marketing Institute, 2008a, 2008b). This assessment was developed in the form of a questionnaire and contained the following five sections: demographic data, food safety knowledge scores, in-store procedures, employment experience, and participant perceptions about food safety.

The questionnaire contained both open-ended and close-ended questions in a variety of formats including checklist, multiple choice, and Likert-type items. Two forms of the questionnaire, one for managers and one for employees, were developed to obtain as much information as possible from within the grocery stores. Participants were informed that they would in no way be penalized for their voluntary participation in the study.

The demographic portion of the questionnaire was constructed to describe employees and managers that work in the food bar department of grocery stores. Information gathered in this section included the individuals' employment history, gender, and education level. There were some questions regarding the individuals' previous training experience included in the demographic section of both the manager and employee forms.

The food safety knowledge portion of the questionnaire was composed of 16 multiple choice questions. These questions were based on SuperSafeMark® material that was specific to hot and cold self-service food bars. Four answer choices were constructed for each question: one being the correct choice, one choice that was close to the correct answer and hard to eliminate, another choice that was halfway in the middle of correct and incorrect and could be eliminated through reasoning, and the fourth choice was easily eliminated and incorrect. These answers were randomized for each question. Responses were either scored a one for the correct answer or a zero for any of the incorrect answers. Scores for individual questions were summated for an aggregate knowledge score. The highest score possible was 16 points.

A pilot test was conducted to establish the reliability of the instrument. A group of 21 workers from university dining services completed the employee format of the questionnaire as it was more applicable to participants. Data collected was analyzed using SPSS 16.0. Kuder-Richardson 20 coefficients were used to measure homogeneity in order to establish reliability. Analyzing the data resulted in coefficient of 0.47. Adjustments were made to the questionnaire to allow the researchers to accept an improved coefficient of 0.62. According to Nunally (1697), this coefficient is acceptable for the early stages of research.

The questionnaire was assessed for validity as well. A group of food industry experts and world-renown food scientists examined and established the content validity of the questionnaire. Face validity was established by a panel of agriculture educators with experience in the field of survey development.

Data collection occurred in two modes. Convenience for both the researcher and respondent was the driving factor in the administration of the questionnaire in the first chain of stores. Zoomerang® was used to facilitate an online questionnaire. Managers and employees accessed a link on a website and completed the questionnaire. Results were exported from Zoomerang® into an Excel® spreadsheet. The participants from the second chain of stores were not able to complete the online questionnaire due to union constraints. Paper booklets for each form were then sent to participants. They then filled out the questionnaire and sent it back to the researchers. The survey was open on Zoomerang® until all of the paper questionnaires were received.

The survey was determined to be primarily descriptive in nature. Correlation research was also conducted to look at factors that have an effect on food safety knowledge. The data was entered and analyzed using SPSS 16.0. Descriptive data were reported using frequencies, means, medians and modes. Data gathered through correlation research were analyzed using a point-biserial correlation coefficient. This analysis of data was used to make recommendations for the training program and prioritize the needs to be addressed.

Findings

The purpose of this study was to conduct a written needs preassessment for a food safety training program. The data collected through the preassessment phase were analyzed, and needs areas were identified through the results of this study. Demographic data and data specific to types and methods used for training programs in the past are reported below.

The first objective was to describe managers and employees demographically. The main difference found between the two groups is the amount of time served with their current employer and in the industry. The mean for length of grocery industry employment is longer for managers (M = 10.60, SD = 7.77) than employees (M = 6.06, SD = 6.75). The same is true for time served with their current employer, where managers had a mean of 7.92 years (SD = 6.71), and employees had a mean of 3.44 years (SD = 3.22). The gender split was relatively even for managers and not even for employees. A high majority of both managers (96.9%) and employees (97.1%) had at least a high school education.

Measuring food safety knowledge was the intent of the second objective. This data was collected to identify areas of need for which training should address. Table 1 contains the number of managers and employees that answered each of the food safety knowledge questions correctly. There were five questions which 50% or less of managers and employees answered correctly including the following: (a) what is number one contributing factor leading to foodborne illness, (b) what temperatures should hot held foods be kept at, (c) between what temperatures is the temperature danger zone, (d) how often should temperatures of foods be taken, and (e) how are foods that require proper temperature control to assure food safety referred to? Over half of the employees missed one additional question: What is a foodborne illness outbreak?

Table 1
Food Safety Knowledge Frequency of Correct Responses

	Manager (n = 33)		Employee (n = 74)	
Question	Frequency	Percentage	Frequency	Percentage
Storage that needs correction	33	100.0	64	86.5
Utensil on self-service bar	33	100.0	73	98.6
Temperature danger zone	32	97.0	68	91.9
Effective way to control bacteria	31	93.9	63	85.1
Refrigerated food temperature	31	93.9	50	67.7
Food safety program focus	30	90.9	65	87.8
Good personal hygiene	30	90.9	59	79.7
Four steps in effective cleaning	29	87.9	59	79.7
Foodborne illness outbreak	27	81.8	32	43.2
HAACP critical limits	27	81.8	55	74.3
Surface cleaning general rule	26	78.8	64	86.5
Temperature danger zone time	18	54.5	33	44.6
Contributing factor to illness	16	48.5	30	40.5
Hot held food temperatures	15	45.5	13	17.6
Food require proper temperature	15	45.5	21	28.4
Temperature frequency	15	45.5	21	28.4

Table 2 contains a summary of the food safety knowledge scores of both managers and employees by demographic. This table addresses the third objective in comparing food safety knowledge scores among demographics. Female managers (M = 12.22, SD = 2.13) scored higher than male managers (M = 12.07, SD = 2.13). The vice versa was true for employees where males (M = 11.49, SD = 2.73) scored higher than females (M = 10.45, SD = 2.05). Food safety knowledge scores improved with education level with the exception of culinary and technical education.

Table 2
Mean for Aggregate Knowledge Score by Gender and Education

	Manager (n = 32)				Employee (n = 69)			
Characteristic	n	f	M	SD	n	f	M	SD
Gender								
Female	18	56.3	12.22	2.13	53	76.8	10.45	2.05
Male	14	43.8	12.07	2.09	16	23.2	11.19	2.73
Education								
Some High School	1	3.1	7.00	-	2	2.9	11.50	3.54
High School Diploma	15	46.8	12.20	2.21	35	50.7	10.23	2.34
Some Culinary/Tech	4	12.5	12.00	1.16	10	14.5	11.50	1.43
Graduated Culinary/Tech	2	6.3	11.00	2.83	8	11.6	9.88	0.84
Associate’s Degree	6	18.8	12.33	1.37	5	7.2	10.60	1.95
Bachelor’s Degree	3	9.4	13.33	1.56	8	11.6	11.62	2.50
Master’s Degree	1	3.1	15.00	-	1	1.4	12.00	2.14

The relationships between food safety knowledge score and age, as well as between food safety knowledge and experience are reported in Table 3. According to Davis (1970), there was a negative small relationship between both manager and employee age and food safety knowledge score. The relationship between manager experience and food safety knowledge score was positive and low (r_{bp} = .24) while employee experience and food safety knowledge were positively related at a negligible level (r_{bp} = .03) (Davis, 1970).

Table 3
Correlation of Aggregate Knowledge Score by Age and Experience

	Manager (n = 33)		Employee (n = 69)	
Characteristic	n	r_{bp}	n	r_{bp}
Age	32	-.25	67	-.29
Experience	33	.24	68	.03

The intent of objective four was to describe past food safety training experiences of managers and employees in regards to what they had been exposed. Classroom training was reported by 84.8% of managers, whereas on-the-job training was reported by 67.1% of employees. Video and classroom training were also reported by large percentages of employees (49.3% and 45.2% respectively).

Objective five sought to compare food safety knowledge means among past food safety training experiences. Comparisons of manager food safety knowledge scores on types of training are summarized in Table 4. There were only two out of seven methods of training in which managers who completed that type of training scored higher than those who did not complete that type of training. Those types were classroom and video training. There were four of eight training programs that produced the same results for managers including the following: state, company, city or county, and Experior programs. A finding to take issue with was that managers who had never been certified scored higher than those who had.

Table 4
Manager Mean for Aggregate Knowledge Score by Training Type (*n* = 33)

	Participated			Did Not Participate			*Cohen's d*
Type	*n*	*M*	*SD*	*n*	*M*	*SD*	
Method							
Classroom	28	12.32	2.13	5	11.40	1.52	0.46
Video	10	12.60	2.22	23	12.00	2.00	0.30
Program							
State	18	12.56	2.05	15	11.73	2.22	0.40
Company	8	12.38	2.24	25	12.12	2.24	0.12
City or County	7	13.29	2.07	26	11.88	2.07	0.70
Never been certified	2	12.50	0.71	31	12.16	2.12	0.17
Experior	1	16.00	-	32	12.06	1.97	0.49

Table 5 summarizes comparisons for employee food safety knowledge means by training types. The reported methods and types are those for which employees that completed that type of training scored higher than those who did not complete that type of training. On-the-job, classroom, textbook and web-based (Internet) were the four methods for which this condition was true. Employees who had completed no training scored higher than those who had completed training. Programs for which the same condition held true were company, city or county, and Food Safety Manager.

Table 5
Employee Mean for Aggregate Knowledge Score by Training Type (*n* = 73)

	Participated			Did Not Participate			*Cohen's d*
Type	*n*	*M*	*SD*	*n*	*M*	*SD*	
Method							
On-the-job	49	10.59	2.31	24	10.25	1.92	0.16
Classroom	33	11.15	2.21	40	9.93	2.02	0.59
Textbook	14	10.86	2.14	59	10.39	2.20	0.22
Web-based (Internet)	3	13.33	2.89	70	10.36	2.09	1.42
None of the methods	1	12.00	-	72	10.46	2.19	0.71
Program							
Company	15	11.53	1.96	52	10.27	2.20	0.59
City or County	13	10.85	2.19	54	10.48	2.21	0.17
Food Safety Manager	9	12.33	1.73	58	10.28	2.14	0.99

Conclusions, Implications, and Recommendations

Employee demographics were described for the purpose of accurately identifying the audience of the training program to be developed. A gap in reports of previous studies was found in regard to demographics of grocery industry managers and employees. There were more female respondents in both categories than males. The gender gap in managers was small (18 females to 14 males), whereas the gender gap in employees was larger (53 females to 16 males). The difference between groups could be explained by the smaller sample size, or it could be that gender in managers is more evenly distributed than in employees.

The level of education was another demographic variable that was assessed. A high school education was the most commonly reported level at 46.8% of managers, and 50.7% of employees. A large majority of respondents graduated high school, as 96.9% of managers and 97.1% of employees had at least a high school diploma.

The level of education of managers and employees should be considered when developing training programs. Content should be presented at a level consistent with a high school education to ensure that most employees and managers can comprehend the lessons.

Data were also gathered on the length of current employment and length of employment in the grocery industry for each respondent. The highest frequencies were lower for employees (1-2 years and 3-5 years respectively) than for managers (6-10 years and 16-20 years respectively). This can be explained by the promotion of employees in the industry to management somewhere in the 6 -10 year range of employment.

Classroom training was highly reported by managers, and video and classroom were reported by large percentages of employees. These methods of training are familiar to grocery industry workers. Past training programs which had been completed by managers and employees was also considered. State certification and ServSafe were the most commonly reported by managers, where as ServSafe, company certification, city or county certification, and not being certified were commonly reported by employees.

Managers and employees expect classroom, on-the-job, and video training because they are familiar with them. These methods should be used to present the training in a way managers and employees are comfortable with. Different methods could be used for supplemental training and to enhance classroom learning. Training programs that have been completed in the past should be considered when planning a new program for grocery store workers. There needs to be enough new information incorporated into the training program to ensure it is worthwhile for those who have completed previous training programs.

Training programs designed as a result of this study need to be accepted for meeting requirements imposed by state, city, and county boards of health. This is supported by findings from research conducted by Kramer and Scott (2004), Worsfold (2005), and York, Brannon, Shanklin, Roberts, Howells, and Barrett (2009). Content presented through the training program should avoid merely restating information presented in ServSafe training that managers have previously completed.

Food safety knowledge was described through 16 multiple choice questions. Five items were answered correctly by less than half of the manager and employee respondents. One additional question was missed by over half of employees. The majority of managers, however, answered that question correctly. Need areas were identified by content topic to address the questions missed by the majority of respondents. Temperature of foods is identified as a need area for manager and employee knowledge. The second need area relates to foodborne illness outbreak. These findings are consistent with those of a previous needs assessment performed by Cody, O'Leary, and Martin (n.d.). These needs areas should be addressed. Content modules should be developed to cover material related to these areas.

The first limitation that needs to be addressed is the procedure for selecting stores to participate in this study. Stores were selected by upper management at two grocery store chains for participation. The companies granted access to those particular stores. The selection process; therefore, was purposive and not random. For this reason results cannot be generalized to the whole population of grocery store managers and employees. However, valuable insight was gained through data collection for the purpose of developing the training program. Needs that enable respondents to answer those questions correctly. The modules should be emphasized in the resulting training program.

Average aggregate food safety knowledge scores were compared by demographics. Female managers (M = 12.22) scored higher on the food safety knowledge portion of the questionnaire than males (M = 12.07). Male employees (M = 11.19) scored higher than female employees (M = 10.45). Comparing means by education level indicated that as education level increased so did mean scores excluding culinary and technical education.

Manager and employee knowledge scores were correlated to age and years of experience. These relationships were low or negligible according to Davis (1971). Therefore, neither age nor years of experience can be relied upon as an indicator of food safety knowledge.

Comparing mean aggregate knowledge scores by training program used did not produce any noteworthy results. In fact, managers and employees that have completed some training programs reported lower means than those who had never been certified. This data is not helpful in determining needs areas, because scores varied and did not produce any kind of pattern that could be used to identify need areas or make recommendations.

The size of this population could be the reason for the described effects reported in the form of Cohen's d. If that is not the case meaningful differences were found for web-based training for both managers and employees. Comparing means by training programs produced meaningful results for Food Safety Manager Certification (both for managers and employees) and Experior (for employees).

Training methods that produced the best results should be used by this training program. A combination of those methods could be used to maximize the scores by presenting different information in the most effective way possible. The methods to be used should include video, classroom, and web-based training based on the results of the study. There is not a large difference in the scores produced by different types of training; therefore, it is practical to consider the most efficient means of training managers and employees in the grocery industry.

Before further research can be conducted, the reliability of the instrument needs to be improved. The questions that were problematic during the pilot test could be removed. It was determined by the advisory board those questions should be left in the instrument, and that the actual sample would be able to answer those questions. Also, the reliability of the instrument could be improved through the development of constructs. Constructs could then be tested and problematic constructs could be redesigned.

The following recommendations for research are the result of the preassessment phase of Witkin and Altschuld's needs assessment model (1995). These recommendations should be considered when planning phase two the data collection phase of the model which is a key outcome associated with the completion of first phase (Witkin & Altschuld, 1995).

The grocery industry is plagued by high turnover; therefore, more research could be done on length of employment. Length of employment could be directly related to age. It would also be valuable to know whether employees move from store to store within the industry or to other industries when they leave their current employer.

Identifying factors that are considered when determining which employees attend training could be valuable. Ideally, all employees should receive food safety training, and it would be valuable to know what changes need to occur in order for that to happen.

Research should be conducted on what managers and employees liked and disliked most about training they have received in the past. Another important consideration is what led to positive or negative experiences or impacts resulting from those experiences. Other data to be collected includes what content was mastered, what methods are most liked and disliked, and what type of presenters most effectively communicated training information. These perceptions and attitudes should be collected from both managers and employees.

More research could be done in greater detail on the effects of different types of training. This would help identify what methods were more successful. Delivery methods could be tested before and after content development to determine which methods are most effective for food safety training.

The reason for managers and employees who have not been certified outscoring those who had been certified through some method should also be investigated. Managers and employees should be asked to identify training needs for consideration.

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Findings of 4-H Impact Studies in Six Western States

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Abstract

Between 2000 and 2007 six western states conducted individual impact studies using public school youth in grades five, seven and nine. Each state slightly modified the instrument used in the first study, however common areas of content included: risk behaviors, leadership positions held, helping others, close relationships with adults, self identity, character, self-confidence and empowerment. The purpose of this study was to illustrate the impact that participating in 4-H had on youth in six western states. Youth who were self-reported members of 4-H were compared to youth were not members. Data reported in impact study reports from each of the six western states were analyzed and compared. The data show that participation in the 4-H Youth Development Program makes a positive difference in the lives of those surveyed. In comparing the data from the six western states, these data show that youth involved in 4-H programs overall had higher positive response values than youth not in 4-H in almost every category.

Introduction/Theoretical Framework

For more than a century, the 4-H Youth Development program, an outreach program of the Land Grant Universities, Cooperative Extension Service and the United States Department of Agriculture (USDA), has provided opportunities and experiences for youth to plan their own learning, work with caring adults, and develop life skills. Starting in the early 1900's as a way to reach rural youth, 4-H has continually evolved, reaching more than 6 million of today's youth nationwide (4-H, USDA). Over time, a fundamental shift in philosophy changed the name from the "4-H program to the "4-H Youth Development program."

According to Hamilton, Hamilton, & Pittman, 2004 (as cited in Heck and Subramaniam, 2009, p. 1), the term "youth development" can be described in three different approaches, '1) a natural process through which youth grow into adults; 2) a set of principles underlying youth programs that encourage thriving among youth; or 3) a set of practices that foster the development of young people." Subsequently, positive youth development (PYD) refers to the developmental characteristics that lead to positive outcomes and behaviors among young people (Heck, et al).

The National Youth Development Information Center (NYDIC) identifies that the area of youth development has become an important focus area in the areas of child development and youth programming. Their website (www.nydic.org) provides many definitions of related terms including. NYDIC defines youth development and positive youth development in the following manner:

> A process which prepares young people to meet the challenges of adolescence and adulthood through a coordinated, progressive series of activities and experiences which help them to become socially, morally, emotionally, physically, and cognitively competent. Positive youth development addresses the broader

> developmental needs of youth, in contrast to deficit-based models which focus solely on youth problems. (www.nydic.org/nydic/programing/definition.htm)

Ali-Coleman (2006) has stated that prevention is not enough when we talk about youth development. He suggested that even if we are successful in preventing high-risk behaviors, we must also help young people prepare for the future by not only helping them to understand life's challenges and responsibilities but to also teach them the life skills necessary for success.

Today's youth are faced with many choices. They have the choice to participate or not participate in many risky behaviors. These behaviors include alcohol use, drug use, smoking cigarettes, shoplifting, damaging property and skipping or cutting class. Astroth and Haynes (2002) found that time spent out-of-school is the largest block of time in a child's life. The hours directly after school, when many children are left unattended, is a time when these negative behaviors and activities double (Astroth, et. al, 2002). What can be done to decrease the number of negative incidents during this time of high activity? After school activities and out-of-school programs that emphasize youth development, such as 4-H, are ways of involving young people while giving them somewhere to be in the hours following school. Keeping youth active and involved in positive and meaningful activities can help decrease negative behaviors.

4-H is a non-formal education program that offers real-life and hands-on learning opportunities to youth. Through participation in 4-H, youth are able to choose their own learning ventures and methods of delivery (Seevers, Graham & Conklin (2007). According to the National 4-H Council (2000),

> 4-H Youth Development Programs provide opportunities, relationships, and support for youth to help them acquire the life skills necessary to meet the challenges of adolescence and adulthood. 4-H Youth Development uses experiential, research-based educational opportunities that help youth become competent, caring, confident, connected and contributing citizens of character. (p.5).

During the last 20 years, many different models and frameworks of youth development have emerged. In a recently published monograph, Heck, et al (2009) reviewed the strengths, limitations and utility of five of the most commonly used models and their use in the 4-H Youth Development Program. Definitions of 4-H Youth Development encompasses elements of many of these frameworks. For example, *The Six C's*, (competent, caring, confident, connected, contributing and character) are described as internal characteristics youth need to develop to grow into healthy adults. Hendricks at Iowa State University is attributed in the development of the *Targeting Life Skills Model* (1996) which focuses on the life skills youth gain through participating in youth development programs. In the early 2000's, National 4-H began promoting a specific youth development framework called *The Eight Essential Elements of 4-H.* These eight elements later became four elements (belonging, mastery, independence and generosity) and are recognized as the critical elements the 4-H program develops in the young people it serves. Frameworks for youth development serve many purposes including identifying long term outcomes created by youth development programs. (Heck, et al, 2009).

Due to its ties to the government, 4-H program leaders are accountable and need to show the effect of the program on the youth it serves. Program success or ability to make a positive difference in the youth that it reaches is a way in which accountability is determined (Boyd, Herring, Briers, 1992). In 1990, Texas placed more responsibility on state government agencies which increased the need for more program accountability. The Texas 4-H program surveyed school children regarding their membership in 4-H and the development of life skills (Boyd, et.al, 1992). They found that there was a significant difference in skills such as leadership, communication and decision making when 4-H members and non 4-H members were compared. They also discovered that the longer youth participated in the 4-H program the stronger their leadership skills became. Seevers and Dormody (1995) surveyed senior 4-H and FFA members in New Mexico, Arizona and Colorado regarding how involvement in these organizations developed leadership life skills. Members with higher frequency of participation and higher levels of leadership activities had a higher gain in leadership life skills.

A goal of The National 4-H Strategic Plan (2001) is to "collect national impact and accountability data that fully demonstrates the impact of 4-H on youth, their families and communities" (p.13). Since 2000, six of the western states have chosen to survey students in the 5^{th}, 7^{th}, and 9^{th} grades in schools across numerous geographically, socioeconomically, and culturally diverse areas of their respective states to determine the impact 4-H has on the lives of its members. In Montana, Idaho, Utah, Colorado, Nevada, and New Mexico, over 13,700 students have been surveyed to determine the impact that being a participant in 4-H had on them. Each study had commonalities that allow for comparisons of 4-H youth and non-4-H youth. Common assessment areas include risk behaviors, leadership positions held, involvement in helping others, having close relationships with adults, ability to talk to parents/guardians about issues and having a positive identity.

Purpose /Objectives

The purpose of this project was to illustrate the impact that participating in 4-H had on youth of the six western states of Nevada, Utah, New Mexico, Colorado, Idaho, and Montana. This was accomplished through an analysis of the data gathered through impact studies generated from each of the six states. The analysis was conducted at the request of the Western Region 4-H Program Leaders to look for the similarities and differences among 4-H and non 4-H members in the 5^{th}, 7^{th}, and 9^{th} grades and determine the impact 4-H has had on the lives of its members. This analysis addressed the following objectives:

1. To describe 4-H and non 4-H youth participation by state
2. To describe students surveyed by grade level
3. To describe self-reported academic performance of 4-H and non 4-H youth
4. To compare 4-H and non 4-H youth on self-reported engagement in risk behaviors
5. To compare 4-H and non 4-H youth on the following social characteristics: level of personal identity, social competency, relationship with adults, helping others and leadership roles
6. To compare 4-H and non 4-H youth on responses to character, self-confidence, and empowerment statements

Methods/Procedures

Six western states, (Montana, Idaho, Utah, Colorado, Nevada and New Mexico) individually conducted 4-H impact studies comparing 4-H youth and non-4-H youth between 2000 and 2007. Each state developed an impact report of findings. Data from these reports were used to compare findings among the six states.

Each state used the same population. Students in the 5th, 7th and 9th grades in public schools across numerous geographically, socioeconomically and culturally diverse areas of their respective states were studied. Public schools in each state were contacted by the county extension agent and/or a representative of the state 4-H office. In almost all state, schools selected were a convenience sample of those willing to participate. The instrument for the study was developed by Astroth, et. al (2000) for the first of the six studies conducted in Montana. Although each subsequent state modified the instrument to focus on some unique aspects in their state, commonalities existed that allowed for a comparison across the states. Common areas of content include, risk behaviors, leadership positions held, involvement in helping others, having close relationships with adults, ability to talk with parents/guardians about issues and having a positive identity. Question formats for each of the domains investigated were not altered, allowing for comparisons across states. Face and content validity were assessed using panels of experts in the areas of youth development, education, health, research and statistics. Reliability of the various subscales was established by Goodwin et.al. (2005). Cronbach alphas for the subscales ranged from .57-.85.

Data from the six impact reports were analyzed and compared. Copies of the impact reports were obtained from published results or by contacting each state directly. Simple descriptive statistics were calculated on most questions. On selected items, Nevada reported results in terms of means and standard deviations, while the other five states reported percentages.

Results/Findings

Of the students surveyed, roughly 25% self-reported themselves as participating in 4-H for at least one year. In the case of Montana, the that number was about 36%, while New Mexico and Nevada reported the lowest numbers between 12.5 and 20 percent. Subjects in each of the six states were either in the 5th, 7th, or 9th grades. New Mexico had the highest percentage of ninth grade students, Colorado the seventh grade students and Utah the fifth grade students. Colorado had the lowest percentage of ninth graders, Utah the seventh graders, and New Mexico the fifth graders. Data were not available from Montana regarding percentages from each grade level (Table 1).

Table 1
Frequencies and Percentage of 4-H and non-4-H members in State Samples

State	N	% 4-H youth 1 year or more	*n*	% non 4-H youth	*N*
Montana*	~2,500	~36.0%	~900	~64.0%	~1600
Idaho	3601	26.00%	943	74.00%	2658
Utah	2067	24.70%	510	75.30%	1557
Colorado	1906	20.60%	294	79.40%	1612
New Mexico	1842	12.50%	230	87.50%	1612
Nevada	1492	11.70%	175	88.30%	1317
Total	~13,408				

*This information is according to Dr. Kirk Astroth (2008) and figures are rough estimates only.

Academic Performance
The data in Table 2 shows that overall, participants in 4-H had higher self-reported grades than non 4-H members. An average of 12.3 percentage points separated 4-H youth with mostly A's from their non 4-H member peers. Margins were much closer in the A's and B's category with non-4-H members actually performing slightly better in Utah and New Mexico. Nevada did not compare grades between 4-H and non-4-H members.

Table 2
Performance in School for 4-H and non 4-H Youth in Percentages

		Mostly A's	A's and B's	Mostly B's	B's and C's	Mostly C's	C's and D's	Mostly D's	Less than D's
Montana	4-H	33.4	37.5	9.7	13.5	2.0	2.4	0.07	0.07
	Non 4-H	19.6	37.7	9.1	20.8	4.2	5.6	1.3	1.9
Idaho	4-H	33.9	38.9	5.9	13.6	2.1	4.2	0.5	0.8
	Non 4-H	22.8	37.9	8.0	17.8	3.7	6.1	1.3	2.4
Utah	4-H	46.1	28.3	8.4	10.4	3.2	2.2	0.4	1.0
	Non 4-H	33.2	34.5	8.5	13.9	2.5	4.4	1.0	2.1
Colorado	4-H	38.2	36.2	5.5	11.4	2.5	4.7	0.5	1.0
	Non 4-H	26.0	32.3	6.1	18.8	3.1	8.8	2.4	2.5
New Mexico	4-H	30.1	28.1	9.3	16.8	6.6	6.1	1.0	2.0
	Non 4-H	17.9	31.6	7.9	23.7	4.1	9.9	1.7	3.0

Engagement in Risk Behaviors

4-H members in all states reporting data were less likely to report they had participated in shoplifting, drug use, driving after consuming alcohol, smoking cigarettes, and engaging in sexual activity than non 4-H members. In Utah, Montana, and Colorado, students active in 4-H were more likely to report having cheated on a test than their peers. 4-H members were less likely to report drinking alcohol. Utah 4-H members were the only member group with data available that reported a higher incidence of damaging property and skipping class than non members. New Mexico 4-H youth self-reported a higher rate of smokeless tobacco use than non 4-H members. Utah students had no reported difference between 4-H members and non members in the use of smokeless tobacco. Data for all categories were not reported by every state. Although most states opted to use percentages, Nevada chose to use the means of the Likert-type results to show the differences in self reported risk behaviors between 4-H and non 4-H youth. Nevada reported no or very minimal difference between 4-H members and non-4-H youth in risky behaviors.

Table 3
Risk behaviors by state and participation in percentages

	Utah		Montana*		Idaho*		Colorado		New Mexico	
Risk Behavior	4-H	Non 4-H	4-H	Non 4-H	4-H	Non 4-H	4-H	Non 4-H	4-H	Non 4-H
Cheat on a test	27.4	20.7	35.8	26.6	25.1	27.8	25.5	23.8	46.7	56.2
Drink alcohol	5.5	6	18.5	22.6	10.9	20.5	16	15.9	22.6	32.1
Shoplift	1.8	5.5	6.9	14.5	5.8	11.5	5.2	6.5	16.2	24.5
Use drugs	4.3	4.4	8.8	18.9	5.7	15.4	4.3	8.1	14.9	21.9
Drive after consuming alcohol	0.9	1.5	4.0	9.0	1.7	5.9	**	**	33.2	32.8
Damage property	9.9	9.3	13.1	19.6	9.7	17.1	9.5	13.7	20.9	28.9
Smoke cigarettes	10.2	11.7	14	22.6	6.9	2	5.6	9.3	21.2	24.5
Use smokeless tobacco	3.4	3.4	**	**	2.3	17.5	**	**	12.3	7.6
Engage in sexual activity	2.8	2.4	**	**	**	**	**	**	16.6	24.0
Skip class	11.2	10.4	**	**	**	**	**	**	18.9	24.7

**Data not available

Discussing Important Issues with Parents/Guardians

In most states, 4-H members reported they discussed important items with their parents/guardians at a higher rate than non 4-H members excluding one exception in Nevada. In Utah and Nevada had the closest percentages between 4-H youth and non-4-H youth. Idaho and Montana had some of the biggest gaps between groups. (Table 4.)

Table 4
Percentages of students who report discussing issues with parents/guardians

Issues discussed	Utah		Montana		Idaho		Colorado		New Mexico		Nevada	
	4-H	Non 4-H	4-H	Non 4-H	4-H	Non 4-H	4-H	Non 4-H	4-H	Non 4-H	4-H	Non 4-H
Drugs	79.0	80.7	75.0	64.0	82.0	71.1	76.4	74.0	66.3	61.0	74.5	75.6
Alcohol	80.0	80.0	72.0	63.0	81.0	70.6	75.4	72.9	66.8	60.9	75.2	74.1
Sex	69.0	68.5	59.0	50.0	72.0	61.2	65.1	62.4	58.6	51.2	63.1	57.0
Other issues	83.0	80.5	77.0	66.0	82.0	72.6	76.8	74.9	68.7	65.3	78.1	77.2

Leadership positions held
In is shown in Table 5 shows that 4-H members are more likely to hold leadership positions, particularly being a committee member or chair. In all six states, 4-H members reported higher levels of elected leadership, having held a leadership position, being a committee chair, and being a committee member.

Table 5
Percentages of youth holding leadership positions

Variable	Utah		Montana		Idaho		Colorado		New Mexico		Nevada	
	4-H	Non 4-H	4-H	Non 4-H	4-H	Non 4-H	4-H	Non 4-H	4-H	Non 4-H	4-H	Non 4-H
Elected leadership	17.6	11.1	32.0	20.0	19.7	13.1	30.6	20.6	18.6	10.9	20.1	11.4
Held leadership position	21.6	16.9	27.4	21.4	20.1	13.7	27.0	20.6	19.2	10.6	20.1	12.9
Committee chair	6.7	5.5	13.2	8.2	5.6	5.1	13.5	9.2	23.9	10.9	9.8	5.1
Committee member	16.5	10.6	25.3	17.2	16.7	9.7	22.2	13.8	20.9	10.9	15.9	9.3

Helping Others
In all six states, 4-H members reported higher rates of helping others by being involved in a help project, giving time or money to charity, and helping the poor, sick, and others than non members (Table 6).

Table 6
Percentages of youth who help others

Variable	Utah		Montana		Idaho		Colorado		New Mexico		Nevada	
	4-H	Non 4-H	4-H	Non 4-H	4-H	Non 4-H	4-H	Non 4-H	4-H	Non 4-H	4-H	Non 4-H
Helped others	95.7	93.2	82.0	74.0	94.5	86.8	**	**	**	**	92.1	85.0
Involved in help project	76.6	60.1	72.0	48.0	63.5	45.1	64.3	47.0	54.0	34.2	62.8	45.9
Given time or money to charity	68.6	59.2	67.0	52.0	61.3	51.5	67.7	53.4	54.4	43.8	58.2	48.4
Helped sick, poor, or others	64.3	53.7	49.0	41.0	54.0	44.5	52.8	44.9	44.6	36.4	52.4	36.8

**Data not available

Positive Identity

Only Utah, Idaho, Colorado, and New Mexico chose to report data related to positive self identify (Table 7). The identity statements included the following: 1)When things don't go well for me, I am good at finding a way to make things better, 2)*I have little control over the things that will happen in my life, 3)On the whole I like myself, 4) *At times, I think I am no good at all, 5)All in all, I am glad I'm me, 6)*I feel I do not have much to be proud of, 7)*Sometimes I feel like my life has no purpose, and 8) When I am an adult, I'm sure I will have a good life

Items with an asterisk were negatively worded items. The students provided responses based upon Likert scale responses (1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree). Positive responses included a combination of both strongly agree and agree responses for questions one, three, five, and eight. Questions two, four, six, and seven (negatively stated items) required a combination of disagree and strongly disagree responses to indicate a positive response. In every state, 4-H members responded positively to every identity statement at a higher percentage than non 4-H members with the exception of two instances in Utah. 4-H participants in Utah were less likely to respond positively to statements 4 and 7 than non 4-H members. Nevada opted to use the means from the Likert-type responses to determine the degree of positive identity in the students that completed the survey. 4-H students were more likely to have mean scores corresponding to having a positive identity for every statement listed except for statements 5 and 6 (I'm glad I am me, and I don't have much to be proud of).

Table 7
Percentage of students who responded positively to the identity statements

Question number	Utah		Idaho		Colorado		New Mexico	
	4-H	Non 4-H	4-H	Non 4-H	4-H	Non 4-H	4-H	Non 4-H
1	66.9	63.7	67.0	62.2	59.8	58.5	68.6	59.8
2*	54.8	45.7	52.9	47.7	58.7	48.0	45.1	41.7
3	78.4	77.7	81.8	75.9	81.1	74.2	71.2	68.2
4*	37.2	37.4	39.8	38.6	41.1	40.69	44.5	41.4
5	82.0	80.8	85.1	82.6	86.7	81.8	79.8	77.2
6*	72.1	67.3	77.1	61.5	78.4	67.2	66.5	61.87
7*	61.2	61.9	66.9	59.6	67.9	60.2	66.7	57.2
8	75.9	74.9	77.3	74.1	**	**	**	**

* negatively stated items
** Data not available

Character, self-confidence, empowerment
4-H youth in four states were more likely to report having higher feelings of character, self-confidence and empowerment than non 4-H members (Table 7). Utah, Colorado, and New Mexico chose to include these data in their research reports by percentages, Nevada reported mean scores.

In 29 of the 33 comparisons, 4-H members responded more positively to the character, self-confidence, and empowerment statements than non 4-H members. 4-H youth in both Utah and New Mexico responded less positively than non 4-H members for statements 1 and 4. Table 8 shows the response rate of those students that were asked questions relevant to character, self-confidence, and empowerment. The question with the asterisk is a negatively worded statement. The results from the Nevada study are again recorded in means of the response value of the Likert-type scale as opposed to percentages. 4-H members in Nevada reported higher positive means to all statements than non 4-H members with the exception of statement 3 (Ten years from now, I think I will be happy).

Table 8
Percentage of students who responded positively to character, self-confidence, and empowerment statements

Statements	Utah		Colorado		New Mexico	
	4-H	Non 4-H	4-H	Non 4-H	4-H	Non 4-H
1.I can do things on my own	79.8	80.4	85.6	77.1	68.5	74.3
2.I set goals	80.7	74.5	77.4	68.7	72.8	62.7
3.Ten years from now, I think I will be very happy	82.9	81.6	82.3	77.1	79.5	72.3
4. I am responsible for my actions	89.2	89.5	86.1	86.6	80.4	82.4
5. Adults in my town or city make me feel important	67.2	61.7	54.7	45.6	52.3	39.7

6. Adults in my town or city listen to what I have to say	55.5	52.6	44.7	38.2	48.9	34.0
7. Adults in my town or city don't care about people my age *	56.2	55.4	60.0	55.1	62.3	49.4
8. In my town or city, I feel like I matter to people	61.5	59.6	53.0	44.7	56.3	42.7
9. In my family, I feel useful and important	77.8	78.1	77.6	71.8	77.1	67.2
10. I'm given lots of chances to help make my town or city a better place to live	50.0	48.9	47.4	34.7	48.2	32.3
11.Students help decide what goes on at my school	58.6	58.2	56.6	53.4	54.5	44.8

* Strongly disagree and disagree responses are counted here as this is a negatively worded statement

Conclusions/Recommendations

These data show that participation in the 4-H Youth Development Program makes a positive difference in the lives of those surveyed. In comparing the data from the six western states these data show that youth involved in 4-H programs overall had higher positive response values than youth not in 4-H in almost every category. The number of youth reporting membership in 4-H ranged from 12.5 percent (New Mexico) to 36 percent (Montana). Data were not available to compare how these percentages compare to each state 4-H enrollment numbers.

Participants in 4-H in all six states had higher self-reported grades than non 4-H members. Colorado had the highest difference in self-perceived grade achievement between groups in grades between mostly A's and mostly B's than their non 4-H member peers and Utah had the lowest difference

In all states, students involved in 4-H were less likely to participate in at risk behaviors. In Utah, Montana and Colorado, students active in 4-H were more likely to report having cheated on a test than their peers. In all states except Colorado, 4-H members were less likely to report drinking alcohol. Utah 4-H members were the only member group with data available that reported a higher incidence of damaging property and skipping class than non-members did. The New Mexico data shows the 4-H youth reported they engage in fewer risk behaviors in every category but one in which they self-reported a higher rate of smokeless tobacco use than non 4-H members. 4-H members in all states reporting data were less likely to report they had participated in shoplifting, drug use, driving after consuming alcohol, smoking cigarettes, and engaging in sexual activity than non 4-H members.

In all states, 4-H members also reported discussing important items with their parents/guardians at a higher rate than non 4-H members excluding two exceptions in Nevada. Nevada 4-H members reported a slightly lower rate of discussing alcohol and other issues than non-members. 4-H members are more likely to hold leadership positions, particularly being a committee member or chair. In all six states, 4-H members reported higher levels of elected leadership, having held a leadership position, being a committee chair, and being a committee member.

In all six states, 4-H members reported higher rates of helping others by being involved in a help project, giving time or money to charity, and helping the poor, sick, and others than non-members. In every state, 4-H members responded positively to m identity statements at a higher percentage than non 4-H members. 4-H members were more likely to report having higher feelings of character, self-confidence and empowerment than non 4-H members.

The National Youth Development Information Center (NYDIC) defined positive youth development as a process that prepared young people to meet the challenges of adolescence and adulthood by participating in a variety of coordinated activities and experiences that allowed them to become socially, morally, emotionally, physically, and cognitively competent (NYDIC, 2009). The data from these six impact studies supports that the 4-H Youth Development Program is making a contribution to individuals, families and communities in which these youth are engaged and supports the concept that 4-H is by this definition engaged in positive youth development.

Illustrating the significance of successful youth development programs, like 4-H, should be a priority in the minds of facilitators, educators, and legislators. 4-H activities do not simply teach youth skills in agriculture and home economics, but include non-formal, experiential, educational programs that teach youth valuable life skills (Boyd, Herring, and Briers, 1992). The data gathered from this research will have a great value and assist to encourage educators, parents, legislators and other program leaders to remember the positive impact 4-H has on its members. The results of the study can be used to market and promote 4-H member and volunteer recruitment.

4-H members are developing into mature adults that will be productive members of society as they are less likely to engage in activities that are illegal and/or socially unacceptable. These students are more likely to be successful throughout life as they build on the successes they have achieved while in the 4-H program, either scholastically, or within the program itself. As 4-H members become adults and active participants within their communities, they will have stronger personal relationships and perhaps volunteer for 4-H in the future. It is also likely that because of the leadership development and opportunities that arise in the program that former members will go on to participate and hold other leadership positions both civically and politically.

Program impact and accountability are essential tools for program success and continuation. Program continuation requires support from participants, the community and funding sources. In an era of increased competition for limited resources, funders want to see hard data that a program is making a difference by accomplishing it's mission and goals. Data from impact studies can provide that evidence. These studies have merit individually as they provide a snapshot of the 4-H Youth Development Program in each state. Collectively they support that as an organization, 4-H is meeting it's objective as a positive youth development program. The similarities in the findings from six different state programs support that the results are not random. However, caution in generalizing the results to larger populations should be taken since in almost every situation a convenience sampling procedure was used.

More research would benefit the 4-H program on both the local and national level. Two major areas that further research should focus on are:1)Regional data differences could be compared for similarities and differences and 2)Use of a standardized survey for every state studied so that the all the results can be compared. There is a great deal of data that were not available from about half of the states. A standardized data collection tool would allow more complete evaluation of the 4-H program.

Another area for research that may provide valuable information is to conduct a longitudinal study with the same students to provide insight into the effects of 4-H on the lives of those students over time. "A longitudinal study, although expensive, would measure the influence of the 4-H experience on the younger generation as the sample's characteristics change over time (Tubbs, 2005, p. 91).

This project is meant to be the starting ground for more detailed analyses of the research data from the western states. As the information becomes available, the impact of 4-H by gender, ethnicity, socioeconomic status, and more could be explored. These variables might provide insight into factors related to the differences between 4-H and non 4-H members. These results are very positive for the 4-H program. Van Horn, et al., (1999) summed it up in saying, "If the 4-H program wants to be a force in the future, it needs to be progressive and adaptive to new trends and ideas… It needs to continue to address the issues that face today's youth such as drug, tobacco, and alcohol abuse" (p. 6).

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Exploration of the Use of Twitter on Student Achievement and Course Satisfaction

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Abstract

Is Twitter the next invaluable classroom communication technology for university instructors and students or simply another classroom distraction? Twitter is a social media tool that lets individuals or groups communicate directly with interested individuals, called followers*, through 140-character messages, or* tweets*. Tweets are public and can be accessed online, with or without creating a Twitter account. For this study, researchers utilized Twitter to communicate with students in a sophomore level agricultural communications course. Throughout the semester, the course instructor tweeted to students about changes to course due dates, assignments, and other course administrative topics. Overall, with one exception, student response to Twitter as implemented in this exploratory effort was lukewarm. As a class, students expressed levels of agreement with Twitter opinion statements that fell between the text descriptors of* slightly agree *to* slightly disagree*. However, when examined based on Twitter use, opinions were practically, though not statistically, different. The results revealed that the use of Twitter by university students for academic reasons may be early in the adoption process. Future research is recommended in a similar classroom setting using more frequent tweets to share information with students and to encourage networking among the students of the course.*

Introduction

Social media is the latest wave in information sharing. Social media allows computer-savvy individuals to write, publish, and distribute ideas globally with ease. Unlike publication methods of the past, publishing ideas through social media channels generally involves little to no cost, and occurs at unprecedented speed, without the interference of a publisher, editor, or other aspects of hard copy communications. Popular tools in social media currently include blogs, Facebook, YouTube videos, and the subject of this research, Twitter (McFedries, 2009).
The launch of Twitter in August 2006 allowed users to answer one simple question, "What are you doing?" Twitter users respond to that question in a maximum of 140 character messages, or *tweets*, that are then relayed to interested people (followers) across the world (About twitter: About us, 2009).

As the latest interactive social media tool, Twitter has grown exponentially in its use. The Twitter Web site went from a mere 10 million unique visits per month from across the world in February 2009 to 32 million unique visits in April 2009. In just two months, site traffic increased over three-fold (Schonfeld, 2009). The use of this communication tool has expanded beyond simple communication between groups of friends. Traditional print newspapers and magazines are using Twitter to publish headlines and direct readers to already published articles. Organizations and political leaders including President Barack Obama tweet to their followers encouraging action as well as continued support (McFedries, 2009).

Agricultural communicators have embraced the use of this social media to a varied extent. Two examples of the use of Twitter within the agricultural communications profession include the

Ohio Farm Bureau and AgChat. The Ohio Farm Bureau uses Twitter to disseminate information to nearly 2,900 followers. As of January 6, 2010, over 2,500 messages, or tweets, had been disseminated through the site (Ohio Farm Bureau, 2010). Agchat is an open, public forum that meets once per week to discuss agriculture issues and currently has over 3,300 followers (Agchat, 2010).

In contrast to the enthusiastic use of Twitter by specific agricultural communications entities, Graybill and Meyers (2009) studied Texas commodity organizations and found minimal Twitter involvement. Using a list of 67 commodity organizations obtained from the Texas Department of Agriculture and the Texas Agricultural Council, the researchers performed an environmental scan to determine commodity organization use or non-use of Twitter. Out of 67 commodity groups, only 4 were Twitter users.

Social media use within academia is not a novel idea; social media tools are currently in use by researchers. Irlbeck (2008) used Facebook as a method of data collection to increase response rates in a study on meth use by college freshman. After an initial response rate of 23.7% on an instrument emailed to freshmen college students, Irlbeck used Facebook communication tools to reach non-respondents. Of the non-respondents, 121 students had Facebook accounts and 20.6% of students contacted through Facebook completed the survey to increase the total response rate to 34%.

Twitter has also been introduced in classrooms. The Centre for Learning & Performance Technologies maintains a database of over 1,000 educational professionals currently using Twitter (http://c4lpt.co.uk/index.html). Another Web site, Online Colleges, highlights the recent trend toward the use of Twitter in the university classroom and offers 50 ways for university instructors and students to implement Twitter for increased learning. Suggestions include using Twitter for instructors and students to contact each other, making classroom announcements, and collaborating on projects using Twitter ("50 Ways to Use Twitter in the College Classroom," 2009).

Despite Twitter's strong following, experts draw attention to the negative side of *hyper-connectivity* as facilitated by innovations such as Twitter. Maggie Jackson, author of the 2008 book *Distracted: The Erosion of Attention and the Coming Dark Ages,* draws attention to the negative effect constant connectivity has in an individual's ability to focus fully on single things. "Day by day, we are eroding our capacity for deep attention— the building block of intimacy, wisdom and cultural progress. The implications for a healthy society are stark" (Jackson, 2009, ¶ 3).

Despite this level of adoption of Twitter and the opinions for and against its use, little research exists that illustrates the impact of this communication tool on academic instruction. What does the utilization of Twitter add or subtract from the effectiveness of university agricultural communications classrooms? Are agricultural communications students currently using Twitter to a level that warrants its consideration as a classroom tool? If students are using Twitter, what are they using it for? Are students willing to try using Twitter if an instructor chooses to add the use of the tool to his/her academic course? Can Twitter add to student learning, or is it simply a distraction as authors such as Jackson have suggested?

Theoretical Framework

The theoretical framework for this pragmatic research lies in the diffusion of innovations and specifically, the relative value of Twitter when compared to other instruction tools as perceived by undergraduate students in a specified class. As defined by Rogers (2003) "Relative advantage is the degree to which an innovation is perceived as being better than the idea it supersedes" (p. 229). Relative advantage is one of the most robust predictors of the rate of adoption for an innovation. The more relative advantage an innovation is perceived to have, the greater its chance of adoption.

Purpose and Objectives

This research explored the use of Twitter by university students prior to and during enrollment in a sophomore-level undergraduate agricultural communications course. Specific objectives that guided this work were:

1. Describe sophomore-level university student attitudes, perceptions, and extent of Twitter use prior to the start of a Fall 2009 semester agricultural communications course.
2. Describe changes in attitudes, perceptions, and extent of Twitter use of the same students at the conclusion of the same Fall 2009 semester course.

This paper fits within the National Research Agenda Research Priority Area 4: "Build competitive societal knowledge and intellectual capabilities within agricultural communications" (American Association for Agricultural Education, 2007, p. 5). By staying on the cusp of new technologies, and incorporating new technologies within the courses taught, more adept agricultural communicators can be prepared for the workforce and participation in society as a whole.

Methods and Procedures

The population for this study was students in Agricultural Communications 2302, *Scientific Communication in Agriculture and Natural Resources* enrolled during the Fall 2009 semester (N = 99). The course is required for agricultural communication majors at Texas Tech University and draws additional students from various majors, primarily within the College of Agricultural Sciences and Natural Resources. The course is primarily lecture format with additional materials provided via the course Blackboard Web site.

Students were informed about the study on the first day of the course and that their participation was voluntary and would not influence their course grade. Student participation in the research project would include completing two instruments, one at the start of the semester (given at the end of the first class session) and one at the conclusion of the semester. The instruments were distributed to all students, who had the option of marking a box to withhold their answers from analysis. After completing the instrument, students wrote a randomly-generated number from a sign-in list on their instrument, then turned their instrument in before leaving the room. This identification number was used to connect individual student's pre and post data.

The researcher-designed pre instrument included fourteen questions. Two questions collected information on student grade-level classification and declared major. The remainder of the questions addressed students' awareness, use, and perception of Twitter. Students were given the opportunity to add additional comments at the conclusion of the instrument.

A Twitter account was set up and managed by the course instructor. Throughout the course, the instructor used Twitter to distribute information to students. No novel information was provided through Twitter that was not also provided in class or on the course Blackboard Web site. Tweets included information on quiz dates and availability, changes to the course schedule, and grade availability.

Over the course of the semester 11 tweets were posted concerning quiz dates and availability, course Web site issues, project due dates, and the availability of grades. At the conclusion of the semester, 19 students had added the course Twitter account to their list of followed Twitter accounts.

At the conclusion of the semester, students were asked to fill out a second researcher-designed instrument. Mirroring the initial instrument, this instrument included the items on awareness, use, and perception used in the pre-instrument with additional questions related to the students' use of Twitter for the course. Both instruments were reviewed by faculty members in the Department of Agricultural Education and Communication at Texas Tech for face and content validity.

Findings

Objective 1

Of the 79 students that completed the pre-instrument, five students requested to have their information withheld from analysis for a total of 74 usable instruments (74.7% response rate). The majority of the students in the course (58.1%, *n* = 43) were freshmen, 13 students (17.6%) were sophomores, eight students (10.8%) were juniors, and 10 students (13.5%) were seniors. The two largest majors represented in the course were agricultural communications (*n* = 33, 41.8%) and animal science (*n* = 33, 41.8%). Other majors represented in the course were agricultural education majors (*n* = 7, 8.9%) and a single agriculture science major (1.3%).

When asked if they had heard of Twitter, the majority of students (64.9%, *n* = 48) indicated that they had heard of Twitter, but had no personal involvement prior to the start of the course (Table 1). Twelve students (16.2%) responded that they had a Twitter account, but did not regularly use it. Only five students (6.8%) responded that they had a Twitter account and used it at least weekly.

Of these five students who used Twitter, all reported using it for personal reasons. No students responded that they used Twitter for instructional/learning or professional reasons. When given the opportunity to further state the reasons they were using Twitter, the most frequent response was for networking (*n* = 12, 15.2%) followed by the need for business news and updates (*n* = 9, 11.4%).

Table 1
Awareness and Usage of Twitter by University Students Prior to the Start of Fall 2009 Course

Item	*F*	%
Are you familiar with Twitter? (*n* = 74)		
I haven't heard of Twitter	9	12.16
I've heard of Twitter but have no personal involvement	48	64.86
I have a Twitter account, but do not use it	12	16.22
I have a Twitter account and use it a few times per week	3	4.05
I have a Twitter account and use it at least once per day, most days	2	2.70
How did you first hear about Twitter? (*n* = 73)		
Other	31	42.47
Referred personally by a friend	21	28.77
Online	18	24.66
Though work	2	2.74
Print sources	1	1.37
What is your primary use of Twitter? (*n* = 72)		
Do not use Twitter	64	88.89
Personal	8	11.11
Instructional/Learning	0	0.00
Professional	0	0.00

When asked what they saw as primary advantages to using Twitter, 19 of the 23 students (82.61%) who responded to this question responded that they saw a primary advantage of Twitter as helping them stay connected to people they care about (Table 2). Other advantages indicated were the tool's capacity to introduce them to new people (*n* = 15, 65.2%); the ability to keep up with what people are talking about (*n* = 12, 52.2%) and its flexibility (*n* = 12, 52.2%).

When asked how many people were following them on Twitter, one student responded that he or she had 101 to 500 followers. Others indicated a smaller following with one student indicating that they had 31-50 followers and two students stating that they had 11-20 followers. The remainder of the students indicated that they had 10 or fewer followers. With one exception, students reported identical numbers for followers and following. That student reported having more followers (11-20) than other Twitter users they were personally following (0-10).

Table 2
University Students Perceived Advantages to Twitter Use Prior to the Start of Fall 2009 Course

Item	*F*	%
What are the reasons you are using Twitter? (*n* = 23)		
Networking	12	52.17
Business news & updates	9	39.13
Personal news & updates	9	39.13
Photo sharing	6	26.09
Sending reminders	3	13.04
Brainstorming	2	8.70
Micro-blogging	1	4.35
Data collection (research)	0	0.00
What do you believe is the primary advantages of using Twitter? (*n* = 23)		
It will help me stay connected to people I care about	19	82.61
It will introduce me to new people	15	65.22
Its flexibility	12	52.17
It will help me keep up with what people are talking about	12	52.17
It is fun	10	43.48
It will help me see a new side of people I follow	8	34.78
It is faster than text messaging	5	21.74
It requires a very small investment	4	17.39
Its open platform structure	4	17.39
Its rapid growth in the number of users	4	17.39
It can help build my personal brand	3	13.04
It will make me think about my life	2	8.70
Its brevity	1	4.35
It will make me a better writer	1	4.35
It can create traffic for my blog or Web site	0	0.00
Other	0	0.00

Note. Multiple responses allowed for both questions.

Objective 2

Due to an unforeseen class cancelation during the final week of classes and the scheduled post data collection, response rate for the post instrument was low (*n* = 31). This was 39.2% of the total course enrollment and the potential respondent pool. As such, additional care should be taken by the reader when reviewing the results of the post-course instrument.

When asked if they had used Twitter for class, 10 students (32.2%) responded that they had. Of these ten students, three used an existing personal account, three created an account and used it only for class, three created an account and used it for class and for personal use, and the one remaining student did not create an account but used the Twitter site to view course-related tweets.

The final group of questions on the post-course instrument included 11 statements with which students were asked to mark their level of agreement using a scale of 1 to 7 with 1 representing *strongly agree*, 4 representing *neither agree nor disagree*, and 7 representing *strongly disagree*. Twenty-eight students completed this portion of the instrument (Figure 1).

The ten students who used Twitter during the course believed that the use of Twitter was more convenient and easier to use to stay up on course information than Blackboard or email. These same ten students were less likely to perceive Twitter as a fad that will fade and disappear.

The students who did not use Twitter during the course were more likely to perceive that Twitter had a greater value than did the students who used Twitter for the course. Both users and non-users knew people personally who used Twitter to communicate. Users of Twitter during the course were more strongly aware of others they personally knew who used Twitter than those students who were non-users of Twitter during the course.

Independent samples *t* tests were performed to determine if responses to the 10 opinion agreement statements were statistically different based on use of Twitter for class or non-use of Twitter for class. No statistically significant differences were found.

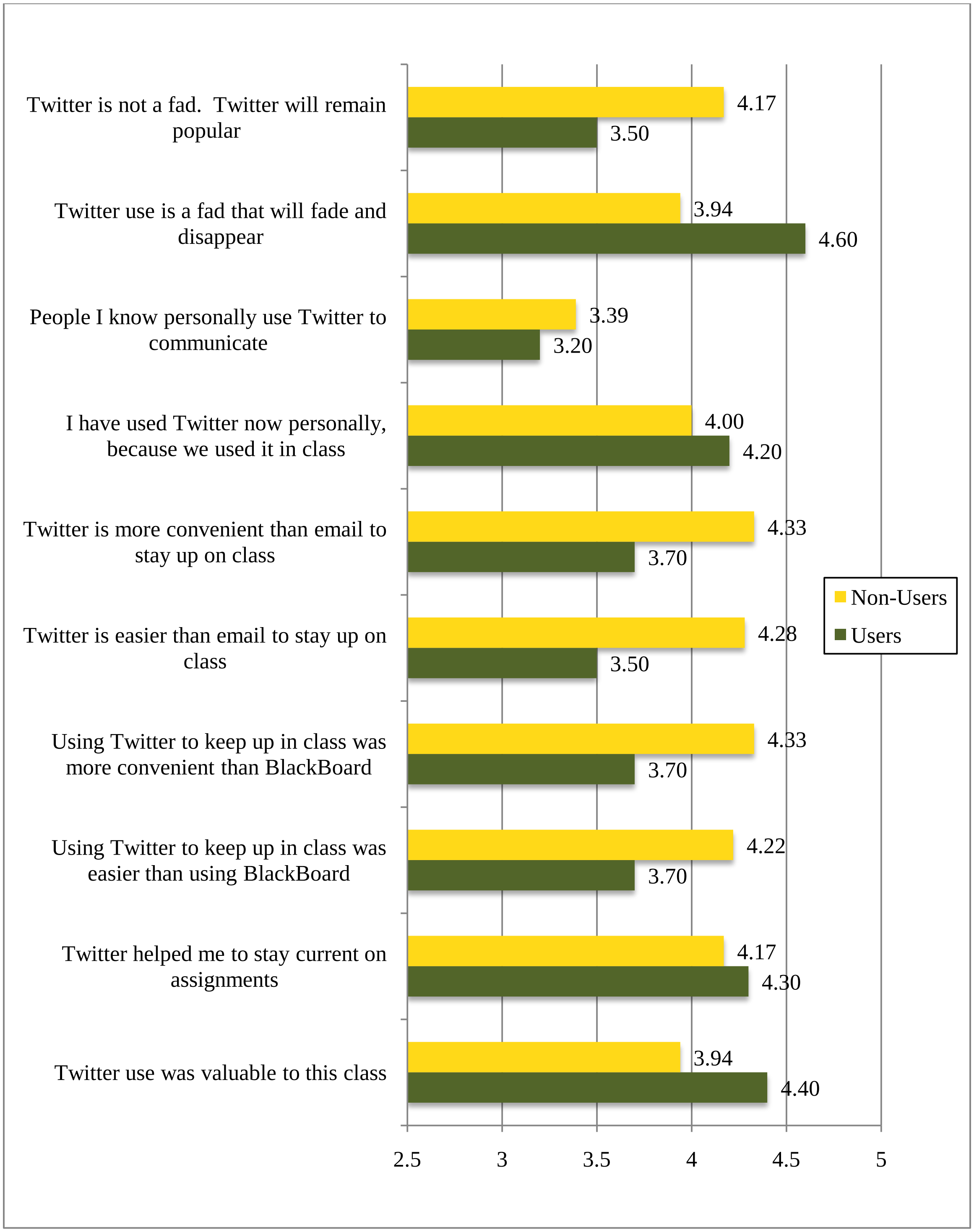

Figure 2: Student Level of Agreement with Twitter-related Statements by Level of Twitter Use. Responses recorded on the scale 1 = Strongly Agree, 2 = Agree, 3 = Slightly Agree, 4 = Neither Agree nor Disagree, 5 = Slightly Disagree, 6 = Disagree, 7 = Strongly Disagree.

Conclusions-Implications-Recommendations

Conclusions

University students in this course were familiar with Twitter, but for the most part, were not using it. The majority of students had heard of Twitter, but had no personal involvement. Simply making Twitter available as a source for course information did not entice many students to use it. At the conclusion of the course, six students reported having created a Twitter account, with three of the students using their Twitter account only for class and three reporting that they used the account for class and for personal reasons. At the conclusion of the semester, 19 students in the course of 99 students total had added the course Twitter account to their list of followed accounts. This represents 19.2% of the students in the course. The increase from 6 students (6.1%) to 19 students (19.2%) represents a 216.6% increase in the number of Twitter users over a roughly 4 month period for a 54.2 % increase per month when averaged across the semester. This is *less* than the increase of Twitter site traffic within the general population as found by Schonfeld (2009).

While Web site visits and new Twitter accounts are not interchangeable terms, nor are they likely perfectly correlated, and comparisons made with the two statistics must be used with caution, this slow rate of adoption by this specific group could be related to the concept of relative advantage within the diffusion of innovations. Students may perceive Twitter to have less relative advantage over other communication methods than do members of the general population and therefore may be less likely to adopt its use.

When asked if they had heard of Twitter, the majority of students indicated that they have heard of Twitter, but have no personal involvement prior to the start of the course. Those that had Twitter accounts seldom used the communication tool prior to their enrollment in the course. The primary advantage they saw of using Twitter was helping them stay connected to people they cared about.

While course-related Twitter users saw advantages of using Twitter for class, the opinions of the non-Twitter users are perhaps the most intriguing. As the group who was "on the outside looking in," these students perceived that Twitter was more valuable to the class than did the users.

These non-user results may be indicative of university students' place in the technology adoption process. Seemingly unaware of this new technology before the start of the course, these non-users of Twitter gained a positive attitude toward the technology through observation of others versus actual trial of the technology.

Recommendations for Practitioners

Due to the exploratory nature of this study, the researchers are hesitant to recommend similar Twitter use by instructors within similar classroom settings. During this research, researchers resisted "overloading" students with constant tweets and did not seek to increase the technological advantage of the tool by providing novel information available only to Twitter users.

In the “additional comments” section of the post-course instrument, four students offered comments that contrasted the researchers thinking on the issue of overloading. One student requested daily updates while another student more brazenly wrote “It was not used very well, you posted only a few times. It was not helpful.” Contrary to other forms of communication, it appears as though one key to successful Twitter usage is to tweet frequently. Similarly, one student commented that Twitter could be used more for student-to-student communication rather than strictly being used for teacher-to-student updates. Based on the comments provided, consideration should be given to increasing the frequency of the tweets from the instructor to the students.

Further, the instructor should consider encouraging the students to follow each other as a form of a support group or information sharing system. If a more private discussion is desired among the students, a student could be encouraged to form a twitter account for the course alone that would be for the students only. This could be a managed account where only enrolled students are permitted to follow.

Recommendations for Future Research

Whether Twitter will become a mainstay for communication within the classroom is yet to be seen. However, future research on the use of Twitter as a tool to increase student learning, course engagement, and academic achievement is warranted as the results revealed through this study may indicate an audience (students) that is early in the technology adoption process.

Researchers recommend implementing comments from students involved in this research in future research in a similar classroom format. What would be the impact on student learning if the instructor tweeted on the course Twitter site every day? Would the increased workload of tweeting daily or twice daily be justified by increased learner engagement? Would the increased workload of tweeting daily or twice daily be offset by decreased dependence on a course Web site or, decreased use of instructor-to-student email?

For students currently using Twitter, distributing course material through Twitter appears to be a viable option. Based on the students not currently using Twitter, the use of Twitter as applied in this research was minimally effective. However, it is likely too early for any final instructional conclusions about Twitter to be made.

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A Qualitative Analysis of Teachers' Conceptions of Agriculture

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Abstract

Teachers associated the agricultural industry with farming. They were not aware of the impact agriculture has on them or their involvement with the agricultural industry. This can be assumed about the teachers who participated in the 2008 Summer Agriculture Institute at Oregon State University. This study examined the teachers' conceptions of the agricultural industry prior to enrolling in SAU and how their conceptions changed throughout the program. The study used qualitative methods to interpret and analyze the data collected from entrance questionnaires, interviews and reflective journals. Entrance questionnaires and interviews established the participants' prior understanding of the agricultural industry. Data suggested the participants equated the agricultural industry with farming. From the reflective journal data it was determined not only were the teachers gaining an awareness of the vastness of the agricultural industry and agriculture is more than just farming there was a maturation in their knowledge held from prior to SAI. This study can help to further the effectiveness of SAI and other similar programs by noting where these programs could focus more attention in order to reach the goals set forth in the agricultural literacy movement.

Introduction

The term agricultural literacy was coined in the 1988 National Research Council's (NRC) report on agricultural education, *Understanding Agriculture: New Directions for Education*. The Council's (1988) definition of agricultural literacy determined an agriculturally literate person should have an understanding of agriculture from a historical, economic, social and environmental perspective. Since the publication of the NRC report, researchers have refined the term agricultural literacy and what it means to be agriculturally literate (Deeds, 1991; Elliot, 1999; Frick & Spotanski, 1990; Frick, Kahler, & Miller, 1991; Pope, 1990; Russel, McCracken, & Miller, 1990; Williams & White, 1991). Meischen and Trexler (2003) purposed an expanded definition of agricultural literacy which included agricultural content and a linguistics definition of literacy relative to culture. The following definition was chosen because it was the most comprehensive and determines the capacities of an agriculturally literate individual.

> Agricultural literacy entails knowledge and understanding of agriculturally related scientific and technologically-based concepts and processes required for personal decision making, participation in civic and cultural affairs, and economic productivity. At a minimum, if a person were literate about agriculture, food, fiber, and natural resource systems, he or she would be able to a) engage in social conversation, b) evaluate the validity of media, c) identify local, national, and international issues, and d) pose and evaluate arguments based on scientific evidence. Because agriculture is a unique culture, an understanding of beliefs and values inherent in agriculture should

> also be included in a definition of agricultural literacy so people can become engaged in the system. (Meischen & Trexler, 2003, p. 44)

In response to the National Research Council's position on agricultural literacy, the Agricultural Education and General Agriculture department at Oregon State University in conjunction with the Oregon Farm Bureau developed an agricultural literacy program, Summer Agriculture Institute (SAI) to promote K-12 teachers in integrating agriculture into their curriculum (Balschweid, Thompson, & Cole, 1997). The 1997 study has shown the program to be effective insofar as the teachers who have participated are integrating agriculture into their curricula, and they have favorable self-reported perceptions of the agricultural industry (Balschweid, Thompson, & Cole, 1997). However, this study lacked an explanation of how the teachers' conceptions of agriculture have changed through their participation in the SAI and it has been the only study conducted on this agricultural literacy intervention.

Other researchers have studied teachers' perceptions of agriculture and have found teachers hold positive perceptions of agriculture (Elliot, 1999; Harris, Clark, & Birkenholz, 1996; Osbourne & Dyer, 1995). A qualitative study conducted on elementary and middle school teachers in Michigan found teachers' perceptions of the food and fiber system were mostly shaped by the media and primarily focused on food safety and nutrition (Trexler, Johnson, & Heinze, 2000). Unfortunately, Vestal and Briers (2000) reported metropolitan newspaper journalists have a "low" level of knowledge when it comes to biotechnology in agriculture. If this is a trend, it is vital to the success of the agricultural literacy movement to properly train the teachers who are implementing agricultural literacy curriculum in the classroom.

Summer Agriculture Institute was a week-long, three credit graduate course for elementary and secondary teachers who have had little to no experience in agriculture. The goal of SAI was to assist educators in using agriculture as a context for teaching mathematics, science, language arts, and social studies while maintaining educational standards. The participants were presented current, factual, and scientific information about agriculture. The participants were given the opportunity to meet the faces of agriculture and take many resources back to their classrooms. SAI is unique insofar as it offers participants the opportunity to spend 24 hours with a farm family. This experience is targeted to give participants to put a face with agriculture and to truly experience one day in the life of a farmer.

Agricultural literacy intervention programs, similar to Summer Agriculture Institute, can be a resource for teachers to be able to learn more about the agriculture industry. SAI provides teachers the opportunity to learn from various producers, agribusiness leaders and agricultural researchers. This program facilitates within teachers a basic understanding of agriculture and the ability to critically observe the agricultural information presented through mass media channels. With this in mind it is vital to the success of the program to determine what teachers are learning about agriculture through their participation in SAI.

Theoretical Foundation

The study used qualitative methods to investigate changes in teachers' conceptions of agriculture from participating in SAI. Before entering into a qualitative research project, the researcher must determine the lens through which they are going to view the data. Lincoln and Guba (1998) stated qualitative research is viewed through a paradigmatic lens; such paradigms are a belief system which is supported on ontological, epistemological, and methodological assumptions.

The constructionist epistemology follows many assumptions of the relativist ontology (Lincoln & Guba, 1998). Such an epistemology assumes the nature of knowledge is constructed by human beings as they interact with the world around them (Crotty, 1998, p. 43). Following the assumptions of relativism, as the human mind develops, realities are constantly changing. For example, a person will have a predisposition to agriculture and as they begin to inquire, their understanding of agriculture develops and a reconstruction of their prior scaffolding occurs. Thus, multiple realities can exist and are subject to constant revision (Lincoln & Guba, 1998).

Relating such an epistemological stance to agricultural literacy and SAI, a teacher might come into the program with certain assumptions and perceptions of agriculture, such as all conventional farms are large cooperate-owned farms that do not care about the environment. It is the aim of inquiry to provide a sophistication of the initial perceptions held by the inquirer or learner (Lincoln & Guba, 1998). It is the aim of SAI to reconstruct and co-construct their understanding of agriculture and change their perceptions of the agricultural industry.

The theoretical perspective which informs the methodology and data analysis of this study was closely aligned with that of symbolic interactionism. There are three basic assumptions which underscore symbolic interactionism and this study: (a) people act toward things according to the meaning they have for them, (b) meaning is derived from and arises out of social interaction, and (c) meanings are modified in an interpretive process with the things and individual encounters (Crotty, 1998). This perspective enlightens the ethnographic methods used in this study. In ethnographic studies the researcher is familiar with the social settings being studied, however must treat it as anthropologically strange in order to get inside the way each group of people sees the world (Crotty, 1998).

Conceptual Framework

Driver (1995) argued students develop concepts of natural phenomena before they are taught science in the school setting. It can be hypothesized the same is true for agriculture. Individuals have already developed concepts of the agricultural industry prior to receiving any instruction. Constructivist school of thought proposes an individual will have built a mental model of their natural surroundings; new ideas are then assimilated into those mental models (Posner, Strike, Hewson, & Gertzog, 1982). The participants in SAI each enter into the program with a mental model of what agriculture means to them, such as viewing a farmer as a middle-aged, white male who wears overalls and tends to livestock in a big red barn. Through participation in SAI, new knowledge would then be assimilated into previously constructed models. In alignment with the nature of knowledge discussed above, each of the participants had different mental models of agriculture. A goal of the study was to determine if patterns emerge from the participants unique mental models of agriculture.

Frick, Kahler, and Martin (1991) proposed an agriculturally literate member of society should have a basic understanding of agriculture. The study determined there are eleven concept areas to agriculture (Table 1) and to be considered literate in agriculture, one must have a basic understanding of each concept area. This study used the agricultural literacy concepts as a framework for analyzing the data produced in the study.

Table 1.
Eleven Agricultural Literacy Concepts and Their Respective Sub-concepts (Frick, et. al, 1991)

Concept area	Sub-Concept
Agriculture's important relationship with the environment.	The agriculturalists role in protecting the environment
	Opinions and perceptions
	Chemicals
	Positive/Negative effects of agriculture on the environment
	Relationship of the environment and agriculture
	Sustainable agriculture
The processing of agricultural products.	Steps and complexity of processing
	Importance of processing and value-added products
	Food safety
	Product development and technology
Public agricultural policy.	Government policy impact on industry
	Unaware public/ consumer
	The government's role and limitation regarding agricultural policy
Agriculture's important relationship with natural resources.	Conservation of natural resources
	Sustainable agriculture
	Stewardship of agriculture
	pollution and depletion of our natural resources
	Codependent relationship between agriculture and natural resources
	Importance for agriculture
Production of animal products.	Consumer concerns
	The uses and roles of various animal species
	Biotechnology and genetics
	Animal husbandry
Societal significance of agriculture.	Society's lack of awareness
	Agriculture's effect on society
	Rural life
	Social benefits
	Food efficiency

Table 1 Continued on next page.

Table 1 (continued)

Concept area	Sub-Concept
Production of plant products.	Greenhouses/ Gardens
	Use and care for plants
	Agronomic practices
	Biotechnology, biology and genetics
	Profit
	Society
Economic impact of agriculture.	Macroeconomics and microeconomics
	Farm management
	Economic benefits and food costs
The marketing of agricultural products.	Marketing plan and strategy
	Global marketing
	Agriculture's function in a market-oriented economy
	Public perception
The distribution of agricultural products.	The distribution system and its importance
	Global distribution and hunger
	Cost of distribution
	Efficiency of distribution
	Distribution sector employment
The global significance of agriculture.	Global food economics
	Global hunger and food distribution
	Technology and university research
	Global politics and sociology

Purpose and Objectives

The purpose of this study was to examine participants' conceptions of agriculture prior to participating in an agricultural literacy intervention and determine how those conceptions changed during their experience. The study was concerned with two primary objectives: (a) determine the agricultural literacy concepts held by the participants prior to Summer Agriculture Institute. (b) determine the changes in agricultural literacy concepts held by the participants during Summer Agriculture Institute.

Methods and Procedures

The population for this study included elementary and secondary education teachers enrolled in the 2008 Summer Agriculture Institute held at Oregon State University. The 14 participants were randomly selected from list of 25 teachers enrolled in the program. The participants of the Summer Agriculture Institute ranged from Pre-kindergarten to high school teachers.

Throughout SAI the researcher participated in a majority of the program, experiencing the program with the participants. This helped to build the rapport of the researcher with the participants. It is important to build rapport and gain the trust of the participants to truly understand them (Fontana & Frey, 1998). Thus, the participants would conceivably feel more comfortable writing their true thoughts about agriculture and not what they think the researcher wants to hear.

Qualitative methods were selected for this study because the researchers desired a descriptive set of rich data which explored the research questions. This study focused on elementary and secondary school teachers during their participation in the Summer Agriculture Institute to ascertain the agricultural literacy concepts learned through their participation. Learning was defined by the appearance of the agricultural literacy concepts in their writing. During their participation the data was collected through entrance questionnaires, interviews, and reflective journals.

Data Collection

Entrance questionnaire.

On the application for Summer Agriculture Institute each of the participants were asked to give their definition of agriculture. Participants also completed an entrance questionnaire upon arrival to Summer Agriculture Institute. The questionnaire consisted of five open ended questions: (a) When you think of the US agriculture and the food and fiber system, what comes to mind? (b) Is it important for your students to understand agriculture? Why? (c) Where do you get information about agriculture? (d) What do you feel your role as an educator is in educating students about agriculture? (e) What do you teach about agriculture right now? The questionnaire was intended to gather data on the teachers' initial conceptions of agriculture and additional information requested by the SAI staff.

Teacher interviews.

There was a set of formal, semi structured teacher interviews. The interviews were audio taped and transcribed to allow for the thorough collection of rich data. The interviews took place upon the teachers' arrival to the Summer Agriculture Institute. This interview consisted of several open ended questions about their understanding of agriculture; desire to learn more about agriculture, and how they plan on using the skills and knowledge gained through SAI in their classrooms. The following questions were used as a guide for the interviews:

- In your own words describe what a farm looks like.
- In your own words describe what a farmer does.
- In your own words describe what the agricultural industry looks like.
- What do you feel your students should know about agriculture?
- Have you ever taught agricultural concepts?
- Where do you get information about agriculture?
- What do you hope to learn from SAI?

Reflective journals.

Each night during the SAI experience, the participants were asked to reflect upon their experiences. The participants were given two prompts to reflect upon; what did I learn about agriculture today and how can I use this in my classroom? The journals provided the researchers a means to more fully understand the participants' level of understanding of agriculture and determine the maturation of the participants' perceptions of agriculture.

Data Analysis

All of the data were coded to allow for ease of analysis. Topic coding and analytical coding (Richards, 2005) were used to reduce the data into categories. Each data source was topically coded for the eleven agricultural literacy concepts. Each of the coded items was then coded for the level of understanding. The codes of awareness, basic understanding, and deep understanding were used to differentiate responses. The agricultural literacy sub-concepts (discussed in Table 1) were used to determine the level of understanding. For example, if a participant mentioned that agriculture had a large impact on the community, but did not go any further, the response would be coded for an awareness of economic impact. If the respondent went into greater detail, it would be coded for a basic understanding. Using economic impact as an example, the respondent may mention that agriculture has a significant impact on the economy and give an example where prices for commodities on the farm would affect the prices of food in the stores. To have a deep understanding the respondent would have given an example how farm prices of one commodity, crude oil, could affect the price of other commodities, corn, thus raising the price of food in the marketplace and the cost of ethanol blended fuels at the gas pumps.

As an example of the coding system used in the entrance questionnaires, the definitions of two teachers were analyzed in Table 2. The first definition of agriculture contains three parts; production of plant products, production of animal products, and relationship with natural resources. The definition mentioned three different agricultural concepts, however the participant's definition was superficial and did not demonstrate a deep understanding of agricultural industry and was therefore coded at the awareness level. The second definition only contained two concepts and was even more superficial in understanding in comparison to the first definition.

Table 2.
Participant Definitions of Agriculture

ID	Definition	Code	Level	Code	Level	Code	Level
CG	The practice and study of crops, livestock, and land management	Plant	Awareness	Animal	Awareness	Natural Resources	Awareness
KC	The industry of farming- land or livestock	Plant	Awareness	Animal	Awareness		

Following coding, a descriptive analysis was conducted to determine what themes were emerging from the data (Huberman & Miles, 1998). To uncover the changes in conceptions, the data was examined chronologically from each participant. Entrance questionnaires and teacher interview data were used to determine teachers' initial conceptions of the agricultural industry. Data analyzed from the reflective journals were used to determine changes in conceptions. The researchers then examined the data to find patterns which emerged from the changes in conceptions.

Validity Issues

Dooley (2007) stated that trustworthiness is the level at which the findings of the study accurately represent the respondents and their contexts. She also noted to achieve internal validity or credibility of a study; the researcher must represent the multiple realities accurately. Triangulation of data collection methods reduces the chances the conclusions will contain systemic bias or reflect the limitations of a specific data collection method (Gall, Gall & Borg, 2005).

This study used methodological triangulation (Denzin, 1970) by analyzing data collected from entrance questionnaires, interviews, and reflective journals to validate conclusions. In order to obtain investigator triangulation (Denzin, 1970) the study used three independent researchers who coded each of the data sources and individually analyzed the data prior to collaboration. Two of the researchers were directly involved in the program; the third researcher was independent of the program. The third researcher was used to account for any bias the researchers had from participating in Summer Agriculture Institute along with the participants. Additionally, the researchers used participant observations to confirm the teachers' statements and reduce self-reported bias in the teacher interviews.

The bias of a researcher can skew the results of a study (Gall, Gall, & Borg, 2005). It is important for a qualitative researcher to state their bias in order to understand how the researcher's values can influence the findings and conclusions of a study (Maxwell, 1941). The researchers are all part of the agricultural education community and believe that it is important for individuals to have a basic understanding of agriculture. The researchers were aware that the selection of teachers with little to no experience in agriculture enrolled in the Summer Agriculture Institute were going to show gains in understanding of the agricultural industry, in order to minimize any selection bias, the researchers' randomly selected participants. Additionally, the researchers' utilized the eleven agricultural literacy concepts as a framework for coding the data to minimize any bias in data analysis.

Findings

Quotations from participants were used as evidence to support the results of the study. Initials were used to protect the anonymity of the participants.

Conceptions of Agriculture

Application definition.

On the application for Summer Agriculture Institute the participants were asked to define agriculture in their own words. This definition demonstrated the prior knowledge and conceptions of the teachers toward agriculture. The data was coded and analyzed to determine how the teachers as a whole defined agriculture, and to serve as a benchmark for initial understanding in order to examine the rest of the data.

Table 3 categorizes the definitions of agriculture from the participants into awareness and basic understanding. All of the participants noted plants in their definition and 12 mentioned the raising of livestock. The production of plants and animals are the basic concepts which one would generally associate with farming. It was evident the participants definition of agriculture was strongly influenced by production agriculture or farming. Therefore if can be assumed that upon entering into the Summer Agriculture Institute the participants equated the agricultural industry with farming.

Table 3.
Level of Understanding of Agricultural Literacy Concepts in Participant Definitions.

	Awareness	Basic Understanding
Plant Production	10	4
Animal Production	10	2
Economic Impacts	3	0
Relationship with Natural Resources	1	0
Marketing	1	0

Note. n = 14.

Noting the overwhelming notion suggesting agriculture is farming, the researchers desired to further examine the participants' conception of farming and the agricultural industry. On the entrance questionnaire, the participants were asked the question; when you think of the U.S. food and fiber system, what comes to mind? This question was aimed at obtaining more information regarding the participants' conceptions of agriculture and to confirm the findings from their initial definition of agriculture. The researchers wanted to determine if there was a deeper understanding of the agricultural industry and if the teachers' conceptions encompassed more than farming.

Entrance questionnaire.

The first item on the questionnaire asked the participants to write down what came to mind when they thought of the food and fiber system. This question had a greater variety of responses than the definition of agriculture on the application (Table 4). Three of the participants directly

Table 4.
Level of Understanding of Agricultural Literacy Concepts in Participant Responses to Food and Fiber System.

	Awareness	Basic Understanding
Plant Production	7	0
Animal Production	7	0
Public Policy	4	0
Societal Significance	3	1
Processing	2	0

Note. n=14

mentioned regulations, but did not elaborate as to the extent of the role of regulations in agriculture. Three other participants mentioned balanced nutrition, food choices, and school lunch programs. The responses portrayed the participants' awareness of some of the societal impacts of agriculture. However, half of the respondents once again solely mentioned the production of plants and animals. The one response which demonstrated a basic understanding equated agriculture with life, "without it we would not exist" (MS). Through participant observations the researchers were able to verify the participants' basic understanding of the societal significance of agricultural.

Interviews.

The data from the previous two sources suggested the participants' conception of the industry equated agriculture with farming. Wanting to more deeply examine the participants' concepts on production agriculture the researchers asked questions to gather additional data on the distinction between farming and the agricultural industry. The participants were asked what they thought a farm looks like, what a farmer does, and what they thought of in regards to the agricultural industry.

The first question in the interview asked the participants to describe what they thought a farm looked like. One of the participants could not begin to describe what a farm would look like, and did not respond to the question. Five of the participants' responses were very superficial at defining a farm. One participant responded, "When I think of a farm, I think of a big red barn" (JL). Another responded with "I think all I know about a farm is what I've seen on TV, Little House on the Prairie like" (SV). The other eight participants were a little more in depth with their responses and noted the variety of production, size of the farm, and production methods. The researchers considered four of the participants to have a basic understanding of production agriculture.

When asked about the agricultural industry, eleven of the fourteen participants restated their original claims associating agriculture with farming. The other three participants all referenced that the agricultural industry is larger than it appears to most people. Table 5 shows the responses of the three participants who elaborated on the vastness of the agricultural industry. Because of the difference in explanations, the researchers examined the background of these three participants to determine what would separate them from the other SAI participants. Each of these participants had past agriculture experience. GK and MS both grew up on family farms and GA has a university degree in animal sciences. The researchers believed this could be the reason for the three participants having a basic understanding of the vastness of the industry.

Through the three sources used to obtain the participants' initial conceptions of agriculture; it is clear each of the participants have their unique model of what agriculture is to them. As the researchers examined all of the evidence, the data suggests the participants mainly see the agricultural industry as farming. The reflective journals were used to establish if there was maturation in conceptions held by the participants.

Table 5.
Participant Responses to Appearance of the Agricultural Industry.

ID	Response
GK	The agriculture industry is a business, supply and demand and hopefully the goal is to feed people and good food and products. It works a lot like a normal business.
GA	I think it's real diverse and I don't think people understand how diverse it is and it goes from what you do in the morning to what you slip into at night time to what you eat to what you wear. It's not just USDA it's so many things that I don't think people have a clue, personally.
MS	[The agricultural industry] is bigger than we see on the surface because it is more than the farm that you drive by. There are a lot of different extensions to it and I mean that it is linked to almost everything that we are a part of in some way or another.

Changes in Conceptions
From the previous data sources it was evident a majority of the participants were only aware of the production aspect of the agricultural industry. The participants were asked to write what they learned about agriculture each day. In order to test the second objective of the study, what were the conceptions of agriculture held by the participants during SAI; the researchers combed through the participants daily journals to find evidence of the participant's knowledge of the agricultural industry. The data were coded for the eleven agricultural literacy concepts. After coding, the data were examined to determine if there was a maturation of knowledge by the participant. Table 6 shows the participants' level of understanding of each of the eleven concept areas of agricultural literacy.

Table 6.
Participants' level of understanding of the eleven agricultural literacy concept areas after participation in SAI organized by level of basic understanding then awareness.

	Awareness	Basic Understanding	Deep Understanding
Production of plant products.	9	5	0
Agriculture's important relationship with the environment.	7	2	0
The global significance of agriculture.	4	2	0
Production of animal products.	10	1	0
Economic impact of agriculture.	5	1	0
The processing of agricultural products.	10	0	0
Societal significance of agriculture.	6	0	0

Table 6 continued on next page.

Table 6 (continued)

	Awareness	Basic Understanding	Deep Understanding
The marketing of agricultural products.	4	0	0
Agriculture's important relationship with natural resources.	3	0	0
Public agricultural policy.	0	0	0
The distribution of agricultural products.	0	0	0

Note. n=14

Conclusions and Recommendations

Through participation in Summer Agriculture Institute, it was evident the teachers enrolled in the program were becoming more agriculturally literate citizens. According to Meischen and Trexler's (2003) definition of an agriculturally literate person, he or she should be able to: a) engage in social conversation, b) evaluate the validity of media, c) identify local, national, and international issues, and d) pose and evaluate arguments based on scientific evidence. In order to be considered an agriculturally literate individual one must meet these criteria for each of the 11 agricultural literacy concept areas.

Evidence suggests, prior to enrolling in SAI the teachers' who participated in the study had only a minimal awareness of the agricultural industry. The participants' conceptions mainly consisted of plant and animal production. However, a few of the teachers were aware of economic impact (3), relationship with natural resources (1), marketing (1), processing (2), public policy (4), and the societal significance of agriculture (3). Members of the agricultural industry know the industry reaches far beyond mere crop and animal production.

As the SAI experience progressed it was evident the teachers were becoming more aware of the agricultural industry. The data showed both an increase in awareness of the vastness of the industry and a maturation of understanding of the agricultural literacy concepts. The participants showed awareness in all of the concept areas except public policy and distribution of agricultural products. A few of the participants showed a basic understanding in five of the concept areas; agriculture's relationship with the environment (2), production of plant (5) and animal products (1) , economic impact of the agricultural industry (1), and the global significance of agriculture (2).

This study suggests the Summer Agriculture Institute is making progress toward developing agriculturally literate teachers. The participants in this study demonstrated an increase in awareness and maturation in their understanding of agriculture. However, there is still room for improvement for SAI. It was apparent SAI focuses heavily on the production of plant and animal products in their curriculum. Understandably, it is difficult to shy away from those concept areas with the diversity of plant and animal products produced in Oregon. It is imperative to determine the level of importance of each of the concept areas to determine which should receive the most attention in time-limited agricultural literacy interventions.

A limitation of this study was the fact it only focused on the teachers from one year who participated in SAI and only included data gathered during their participation in the program. In order to truly determine the effectiveness of this program it would be essential to observe the effects of participation on the teachers' curriculum and agricultural literacy levels of their students. Future qualitative research should follow these teachers from their participation in SAI back to their classrooms. Additional interviews should be conducted to explore: (a) their conceptions of the agricultural industry after participation, (b) how they have infused agriculture into their lessons, and (c) how they have continued to learn about agriculture. In addition to interviews, it would also be important to make classroom observations and examine lesson plans for agricultural content.

A study should be conducted to examine the effect of teacher participation in agricultural literacy programs. How does teacher participation in agricultural literacy interventions affect the students' awareness and appreciation of agriculture? Pretest/posttest quantitative methods and interviews should be conducted to ascertain this information.

A unique aspect of the Summer Agriculture Institute is an overnight stay with a farm family. A study should be conducted to examine how this experience differs from participation in the rest of the program. Are teachers obtaining a deeper understanding of agriculture from this experience or is this solely an affective learning experience?

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The Relationship Between Pre-Service Teacher's Psychological Type, Critical Thinking Ability and Teacher Efficacy on Perceived Performance

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Abstract

Experiences during pre-service teaching drastically influence the professional development of pre-service agricultural education teacher's attitudes and perceptions (Harlin, Edwards & Brier, 2002). This experience allows pre-service teachers to interact with students in an authentic learning environment (Knobloch, 2006). The purpose of this study was to examine the relationships between teaching characteristics of pre-service teachers and teaching outcomes. This study employed a descriptive, correlational research design. Pre-service teachers enrolled in the spring 2008 agricultural education teacher preparatory program at Texas Tech University were participants in this study (N = 15). Findings related to teacher efficacy suggest that pre-service teachers in agricultural education feel most efficacious in classroom management. The gain that existed on knowledge scores of students indicates that students did learn accordingly to what the pre-service teachers taught. It is imperative to instill these qualities of future teachers given the importance and impact on student success.

Introduction/Theoretical Framework

The agricultural education profession has recently seen a lack of qualified, competent teachers. The National Council for Agricultural Education (2000) initiated a plan for the future of agricultural education. In this plan entitled Reinventing Agricultural Education for the Year 2020, goal one featured the need for qualified teachers in the agricultural education profession. Goal one states "to provide an abundance of highly motivated, well-educated teachers in all disciplines, pre-kindergarten through adult, providing agriculture, food, fiber and natural resources system education" (The Council, 2000, p. 4). Roberts and Dyer (2003) stated, "Creating effective agriculture teachers is imperative for the long-term sustainability of agricultural education programs" (p. 94). Roberts and Dyer recommend providing additional experiences for pre-service teachers that focus on professional development and personal qualities. Preparatory programs are imperative for the success and retention of future agricultural education teachers.

The pre-service teaching experience is the time in which undergraduate students are prepared for a career in education. This experience allows pre-service teachers to interact with students in an authentic learning environment (Knobloch, 2006). Experiences during pre-service teaching drastically influence the professional development of pre-service agricultural education teacher's attitudes and perceptions (Harlin, Edwards & Brier, 2002). Deeds, Flowers, & Arrington (1991) stated that the quality of preparation programs of future teachers is a concern to the profession because it is a crucial piece in the development of teachers.

Many factors have been attributed to how the future teacher will develop professionally as a successful educator. Environmental factors include student learning abilities (Cano & Martinez, 1991; Cano & Newcomb, 1990), student learning styles (Torres & Cano, 1994; Dunn & Dunn, 1979), learning environments (Hanushek, 1997), student attitudes, and motivation. Personal characteristics include psychological type (Cano, Garton, & Raven, 1992; Cano & Garton, 1994), critical thinking abilities (Rudd, Baker, & Hoover, 2000; Cano & Martinez, 1991), teacher efficacy (Knobloch, 2002; Berman, McLaughlin, Bass, Pauly, & Zellman, 1977), teaching styles (Cano et al., 1992; Dyer & Osborne, 1996), teacher confidence in oneself (Mundt, 1991), and teacher quality and preparation (Darling-Hammond, 1999). Both environmental factors and personal characteristics influence teacher success. Preparation of pre-service teachers is very important to the profession of agriculture education. There is a growing need for highly qualified agricultural education teachers (Kantrovich, 2007). Success during the pre-service teaching experience, teacher efficacy, and confidence gained during this time can possibly influence the retention of agricultural education graduates.

The theoretical framework for this study was based on Dunkin and Biddle's (1974) model for classroom teaching (Figure 1). Dunkin and Biddle's 1974 model consists of properties of teachers and learners. The model focuses on four major variables: presage, context, process, and product. The arrows in the model represent causative relationships (e.g. Teacher training experiences affect teacher behavior). The variables in the model are placed in a particular order. The order also represents causative relationships (e.g. Teacher formative experiences affect and occur first or in conjunction with teacher training experiences (Dunkin & Biddle,

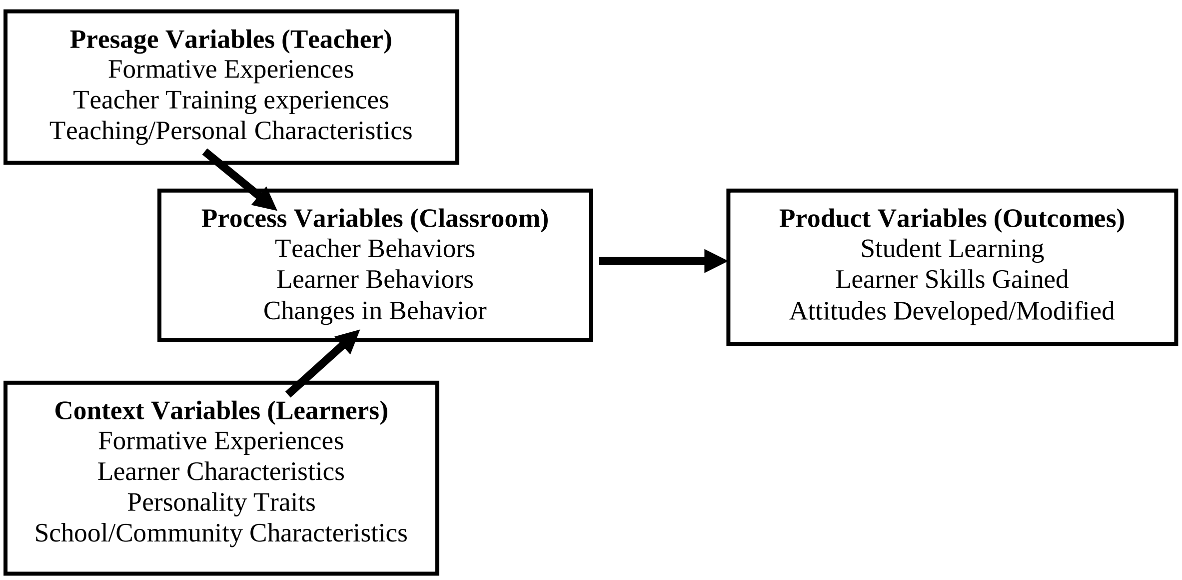

Figure 1. A model for classroom teaching (Dunkin & Biddle, 1974, p.38).

This study examined the presage variables of psychological type (as defined by the Myers-Briggs Type Indicator®), critical thinking ability (as determined by Watson- Glaser Critical Thinking Appraisal®), and teacher efficacy. According to the model, process variables represent the behaviors and interactions that take place during the instructional process. In this study, participants all taught the same unit of instruction. Differences between teacher performance was assessed using a researcher created instrument to measure the degree to which the teacher felt they implemented the instructional plan. The product variable for the purpose of this study was student learning.

Teachers teach the way they were taught (Dunn & Dunn, 1979). Therefore, the way in which pre-service teachers were taught affects their learning and teaching styles. It is important to investigate teacher preparatory programs and the relationship between background and teaching style to adequately prepare future teachers. Also as teachers recognize their own learning and teaching styles they are better able to facilitate for their student's learning styles. Torres and Cano (1994) stated that as instructors know about learning styles they can incorporate appropriate curriculum and adapt instruction.

Psychological type influences teachers in the classroom. According to Lawrence (1993), Teachers who prefer sensing emphasize practical information, facts, and concrete skills. Intuitive types tend to emphasize concepts, relationships, and implications. Sensing teachers usually keep learning centralized and provide students with a narrow range of choices. Intuitive teachers give students a wide range of choices, have students participate in small group activities, and encourage independence. Thinking type teachers rarely comment on student performance but when they do these statements are objective. Teachers who prefer feeling generally provide both praise and criticism. They instruct students as a whole and they have students focus on what they are saying and doing. They like students to work independently but move around to individual students to help them. Judging type teachers stick to schedules and keep orderly classrooms. Perceiving teachers encourage independence, discussions, group socialization, and movement in the classroom.

Critical thinking has been a focus of discussion in education. According to Halpern (1996), one of the most prevalent problems in education practices is the absence of instruction to help students develop critical thinking skills. Paul (1993) suggested an effective way to teach strategies for critical thinking is to model those skills for students. Paul further indicated teachers were thinking at lower levels. If teachers are expected to model critical thinking skills, the critical thinking ability of the teacher should be evaluated.

Researchers have agreed teaching efficacy is complex and difficult to understand (Knobloch, 2001; Tschannen-Moran, 2000). Tschannen-Moran, Woolfolk Hoy, and Hoy (1998) defined teacher efficacy as "the teacher's belief in his or her capability to organize and execute courses of action required to successfully accomplish a specific teaching task in a particular context" (p. 233). Mundt (1991) found that beginning agricultural education teachers lacked confidence in their abilities. Wolf, Foster, and Birkenholz (2008) conducted a study of agricultural education pre-service teachers and teacher efficacy, level of preparation, and professional development. They found that pre-service teachers were most efficacious about classroom management, less efficacious with instructional strategies, and least efficacious about engagement of students.

Knobloch (2002) and Knobloch and Whittington (2003) found that agricultural education pre-service teachers, second year teachers, and third year teachers' teacher efficacy did not change over a ten week period. However, Knobloch and Whittington (2003) found that pre-service teachers had the highest teacher efficacy and first-year teachers had the lowest during the first 10 weeks of the school year. They did find that pre-service teachers were efficacious during the first 10 weeks of the school year. Mundt's (1991) findings were inconsistent with Knobloch and Whittington's (2003) findings. Mundt (1991) found that beginning agricultural education teachers lacked confidence in their abilities.

Perceived teacher performance is a new and unique component of this study. Perceived performance identifies how confident the teachers feel they taught the material effectively, according to the specified instructional plan. This component, when described in relation to student achievement, can be a powerful agent when describing the actions of the teacher during instruction. If a teacher feels confident about the material they have taught, does that indeed have an impact on student success?

Purpose and Objectives of the Study

The purpose of this study was to examine the relationships between teaching characteristics of pre-service teachers and teaching outcomes. The objectives of the study were to:

1. Profile participants on demographic characteristics and school placement characteristics.
2. Describe teaching characteristics of pre-service teachers (psychological type, critical thinking ability, & teacher efficacy).
3. Describe teaching outcomes (perceived teacher performance and student achievement).
4. Determine the relationship between teaching characteristics of pre-service teachers and teaching outcomes.

Methods and Procedures

This study employed a descriptive, correlation research design. Correlational research investigates relationships between variables. Gall, Gall, and Borg (2005) stated that correlational research "examines all the levels of the variables that are measured" (p. 218). There are several advantages to using correlation research. Correlational research allows researchers to determine the extent of relationships, compare relationships, and determine relationships between two or more variables (Gall, Gall & Borg, 2005).

The population for this study was pre-service teachers in agricultural education. There were 15 pre-service teachers enrolled in the spring 2008 agricultural education teacher preparatory program at Texas Tech University (N = 15). Each of the participants were provided with instructional materials for a unit of instruction and the lessons were modeled for the pre-service teachers. All participants received the same resources and preparation.

Data were collected using multiple instruments. The instruments included the Myers-Briggs Type Indicator (MBTI®), the Watson-Glaser Critical Thinking Appraisal (WGCTA®), the Ohio State Teacher Efficacy Scale (OSTES), a researcher developed perceived teacher performance scale, and researcher developed student knowledge tests.

The Myers-Briggs Type Indicator (MBTI®) is a personality inventory based on psychological types which relate to teaching style preferences. According to the MBTI® Manual by Myers, McCaulley, Quenk, and Hammer (1998), a teacher's characteristics, such as psychological type, effects student-teacher interactions in the classroom. The MBTI® is made up of four dichotomies and is categorized by 16 psychological preference types. The MBTI® has been subjected to several reliability tests, evidence from which provides strong support for the reliability of scores produced by the instrument (Myers et al., 1998).

The Watson-Glaser Critical Thinking Appraisal® measures important abilities related to critical thinking. Form S of the WGCTA® was used for this study. It is composed of 16 scenarios and 40 items. The WGCTA® is comprised of five subtests. The subsets are Inference, Recognition of Assumptions, Deduction, Interpretation, and Evaluation of Arguments. The WGCTA® yieldes a raw numeric score. As indicated in the WGCTA® manual, the WGCTA® internal consistency reliability Cronbach's alpha coefficient is .81 for form S (Watson & Glaser, 1994).

Tshannen-Moran and Hoy (2001) developed the Ohio State Teacher Efficacy Scale (OSTES) to effectively measure a teacher's level of efficacy. The OSTES has been established as both reliable and valid. The OSTES consists of 24 items related to teacher efficacy. The OSTES consists of three subscales: efficacy for instructional strategies, efficacy for classroom management, and efficacy for student engagement. The scale is formatted on a Likert-type scale ranging from numeric values 1 – 9 where 1 = nothing, 3 = very little, 5 = some influence, 7 = quite a bit, and 9 = a great deal. The overall reliability for the OSTES 24 item instrument was .94. Reliabilities for the subscales were .91 for efficacy of instructional strategies, .90 for efficacy of classroom management, and .87 for efficacy for student engagement (Moran & Hoy, 2001).

A researcher developed perceived teacher performance scale was used in this study. Pre-service teachers graded themselves on how well they communicated the information and how confident they were on achieving the tasks and unit objectives. The scale consisted of 18 items and was formulated on a Likert-type scale with numeric values ranging from 1-9 where 1 = not at all, 3 = very little, 5 = some, 7 = quite a bit, and 9 = a great deal. The questions formulated pertained to how well the pre-service teachers felt they performed the tasks instructed of them.

The reliability of the perceived teacher performance scale was pilot tested on an undergraduate agricultural education classroom at Texas Tech University upon completion of a teaching laboratory exercise. The reliability was evaluated post hoc and had a Cronbach's alpha of .86. The validity of the perceived teacher performance scale was determined by a panel of experts. The panel of experts was comprised of faculty members at Texas Tech University.

Researcher developed knowledge tests, based on information contained in the unit of instruction, were used to measure student learning in this study. The knowledge tests were administered twice to the students at the pre-service teacher's placement location in the form of a paper instrument. The tests were administered as a pre-test instrument to assess prior knowledge and as a post-test instrument to assess knowledge obtained from the unit of instruction. The instrument consisted of traditional assessment formats including multiple choice, true false, and short answer questions. The instrument was created based on learning objectives. It was reviewed by a panel of experts. The panel consisted of faculty members at the Department of Agricultural Education at Texas Tech University. The pre-test and post-test instruments consisted of the same items but the order was arranged differently for the two instruments.
Pre-service teachers were given all necessary materials and were instructed on how to teach the content. They were also instructed on how to administer the knowledge tests. Pre-service teachers returned the student coding sheet to the researcher which reported pre-test and post-test scores of individual students. The students were numerically coded therefore there were no

adverse risks of confidentiality to students. The coding sheet also included demographic information for individual students including grade level, gender, and ethnicity.

Researchers developed a unit of instruction pertaining to natural resources. Materials included in the unit were lesson plans, activities, PowerPoint presentations, and handouts. Other materials included were the pre-test and post-test knowledge tests, grading keys for the knowledge tests and handouts, student coding sheets (which reported student scores and demographics), and an instruction sheet with a timeline for quick reference. All necessary materials were given to pre-service teachers on a compact disc.

The pre-service teachers also completed instruments to measure their teacher efficacy and perceived performance. Before beginning the unit, pre-service teachers were instructed to complete the Ohio State Teacher Efficacy scale. Upon completion of the unit they were instructed to complete the perceived teacher performance scale. These instruments were located on zoomerang.com.

Data were analyzed using the Statistical Package for the Social Sciences (SPSS) version 15 software. A significance level of $\alpha = .05$ was set *a priori*. Descriptive statistics and frequencies were analyzed for objectives one through four. Correlational statistics were analyzed for objective five. Correlational relationships were described using Davis' (1971) descriptors.

Findings

Demographics from objective one indicate that pre-service teachers (N = 15) were two-thirds male (n = 10, 66.7%) and one-third were female (n = 5, 33%). The majority of pre-service teachers were completing their agricultural education degree as undergraduate students (n = 13, 86.7%). The mean age of pre-service teachers was 22.67 with a mean score of 3.37 for their GPAs.

A slight majority of pre-service teachers reported their classification size of their placement location to being 3A (n = 4) while 1A, 2A, and 4A schools followed next with n = 4 and lastly 5A schools with n = 2. In Texas, schools are divided based on their enrollment to create five classes. While the enrollment numbers change biannually, class 5A schools have the highest enrollment and class 1A schools have the lowest. The majority of pre-service teachers (n = 9) defined their placement location as rural. Both one (n = 4) and two (n = 4) teacher departments represented the most frequent. Over half (n = 8, 53.3%) of pre-service teachers reported their class schedule was regular and met daily for instruction. The majority of pre-service teachers (n = 6, 40%) reported teaching less than ten lessons before teaching the natural resources unit.

Objective two sought to describe teaching characteristics of pre-service teachers. According to the MBTI, the majority of pre-service teachers were classified as extraverts (n = 8) and favored the sensing (n = 11), feeling (n = 8), and judging (n = 9) preferences (see Table 1).

Table 1
Pre-service Teachers' Psychological Type as Defined by the MBTI® (N = 15)

Characteristic	Frequency (*n*)	*f* %	Mode
E/I			Extravert
Extravert (E)	8	53.3	
Introvert (I)	7	46.7	
S/N			Sensing
Sensing (S)	11	73.3	
Intuition (N)	4	26.7	
T/F			Feeling
Feeling (F)	8	53.3	
Thinking (T)	7	46.7	
J/P			Judging
Judging (J)	9	60.0	
Perceiving (P)	6	40.0	

As displayed in Table 2, pre-service teacher's critical thinking ability had a mean score was 23.27 as determined by the WGCTA®. The OSTES has three subscales (instructional strategies, classroom management, and student engagement) to measure teacher efficacy. Subscales had a mean score of 50.27, 52.53, and 47.53 respectively.

Table 2
Pre-service Teachers' Critical Thinking Ability and Teacher Efficacy (N = 15)

Characteristic	*M*	*SD*	Range
Critical Thinking Ability	23.27	6.36	17 – 36
Efficacy in Instructional Strategies	50.27	4.54	41 – 57
Efficacy in Classroom Management	52.53	10.23	39 – 72
Efficacy in Student Engagement	47.53	10.90	26 – 59

Objective three sought to describe teaching outcomes. The mean score of perceived teacher performance was 133.93. The average pre-service teacher response was 7.4 which indicated "quite a bit" of confidence on the perceived teacher performance scale. The mean pre-test score of the knowledge instrument was 64.73 (*SD* = 10.03) and had a range of 45.75 to 78. The mean post-test score was 81.95 (*SD* = 7.22) with a range of 71 to 93. The overall average gain by students had a mean score of 17.23 (*SD* = 5.29) with a range of 9.50 to 25.75.

Table 3
Pre-service Teachers' Perceived Teacher Performance and Student Knowledge Average Scores (N = 15)

Characteristic	*M*	*SD*	Range
Perceived Teacher Performance (Average Teacher Response = 7.4)	133.93	12.14	112 – 155
Student Knowledge			
Average Pre-test Score	64.73	10.03	45.75 – 78.00
Average Post-test Score	81.95	7.22	71.00 – 93.00
Average Gain Scores	17.23	5.29	9.50 – 25.75

The relationships between teaching characteristics of pre-service teachers and teaching outcomes were analyzed for objective five. There was several negligible, low, and moderate relationships found and one substantial, positive relationship that was found with pre-service teachers' teacher efficacy in instructional strategies and perceived performance (r_{pb} = .61).

Table 4
Pearson Product-Moment Correlations Between Teaching Characteristics (Gender, GPA, MBTI®, Critical Thinking Ability, and Teacher Efficacy)and Teaching Outcomes (Knowledge and Perceived Performance)

Variable	Knowledge	Perceived Performance
Gender	.47	-.21
MBTI® – E/I	.20	.19
MBTI® – S/N	.19	.11
MBTI® – T/F	.08	-.14
MBTI® – J/P	-.27	.22
GPA	-.25	.04
Critical Thinking	.28	-.20
TE – Subgroup 1: Instructional Strategies	.31	.61
TE – Subgroup 2: Classroom Management	.12	.35
TE – Subgroup 3: Student Engagement	.35	.42

Conclusions/Implications/Recommendations

Most pre-service teachers surveyed were male, 23 years old and classified as undergraduate students. According to Burris, McLaughlin, Brashears and Fraze (2008), fifth year teachers in Texas were 2/3 male. Similarly, Kantrovich (2007) reported a 3:1 male to female teacher ratio nationally for teachers. Participants in this study were similar in gender distribution.

Most pre-service teachers were placed at 3A rural schools. The results found that the number of agricultural education teachers at the pre-service teacher's placement location was evenly distributed. Both one teacher (*n*=4,26.7%) and two teacher (*n*=4, 26.7%) departments were represented the most frequently. Three teacher (*n* = 3, 20%) and four teacher (*n* = 3, 20%) departments followed and five teacher departments (*n* = 1, 6.7%) represented the least reported number of teachers at the placement locations. These findings are somewhat similar to Burris and Keller's (2008) findings. They found that 37% of first-year teachers reported teaching in a single teacher department, 43% in a two teacher department, 15% in a three teacher department, 4% in a four teacher department, and 1% in a five teacher department. Nationally, Kantrovich (2007) found that there were 5,745 positions at single teacher departments and 4,600.5 positions at multiple teacher departments. This indicates the importance of preparing pre-service teachers to complete their teaching experiences in diverse learning environments. Examples of this are different size schools, rural or urban districts, single or multiple teacher departments and differences in district schedules.

Pre-service teachers mostly preferred the MBTI® dichotomies: extraversion, sensing, feeling, and judging. They also had a mean score 23.27 for their critical thinking ability and had the highest teacher efficacy in the subscale for classroom management. Pre-service teachers' preferences described by the MBTI® almost reached a balance in the extraversion/introversion dichotomy with 53.3% extraverts and 46.7% introverts, and in the thinking/feeling dichotomy with 53.3% preferring the feeling category and 46.7% favored the thinking category. In the sensing/intuition dichotomy a high majority (73.3%) of pre-service teachers favored the sensing preference and the remaining pre-service teachers (26.7%) favored intuition. In the judging/perceiving dichotomy, sixty percent (n = 9) of pre-service teachers fell into the judging preference while the remaining forty percent (n = 6) fell into the perceiving category. These findings were similar to Cano, Garton, and Raven's (1992) findings.

Pre-service teachers were most efficacious in classroom management, less efficacious with instructional strategies, and least efficacious about engagement of students. Wolf, Foster, and Birkenholz (2008) findings agreed with the findings from this study. Findings from objective three for psychological type suggest that students in agricultural education have similar preferences in dichotomies. These similarities should be investigated further to determine if similarities continue with future studies. Findings related to teacher efficacy also suggest that pre-service teachers in agricultural education feel most efficacious in classroom management. This could imply that preparation attained prior to or during the student teaching block give pre-service teachers more confidence in classroom management and less preparation in engagement of students. Findings suggest that additional preparation in student engagement should be implemented into teacher preparatory programs.

Pre-service teachers' perceived teacher performance scores was on average a 7.4. Knowledge scores on average gained 17.23 points. This new and unique measure of teacher confidence, perceived teacher performance, needs to be researched further to make additional conclusions. The overall knowledge scores of students on average gained 17.23 points with the differences of pre-test and post-test scores. The average gain by students ranged from 9.50 to 25.75. The average response by pre-service teachers indicated a significant amount of confidence in their abilities or their perceived performance. This confidence of pre-service teachers' abilities is very important to the overall success of students. Perceived teacher performance needs to be studied further to compare the results of this study. The gain that existed on knowledge scores of students indicates that students did learn accordingly to what the pre-service teachers taught. These numbers imply that pre-service teachers' taught effectively and students did indeed learn the material about natural resources based on prior knowledge and knowledge obtained throughout the unit.

The findings of this study are consistent with previous findings on the affects of teacher efficacy and student performance. Armor et al. (1976) found that teacher efficacy impacted reading scores in students, Berman, McLaughlin, Bass, Pauly and Zellman (1977) found that teacher efficacy had positive effects on student performance, and Ashton and Webb (1986) found teacher efficacy to have positively affected mathematics and language achievement in students. There was one substantial, positive relationship that was found with pre-service teachers' teacher efficacy in instructional strategies and perceived performance (r_{pb} = .61).

Teacher efficacy has an effect on knowledge of students. The more efficacious pre-service teachers are the more students tend to achieve academically. Preparation of future teachers should stress the importance of their efficacy on student success. The more efficacious pre-service teachers were the higher their perceived performance or the higher the confidence in their abilities to teach the material effectively. Also, if they felt confident in their abilities before (with teacher efficacy) and after (with perceived performance) the more successful they were.

Future teachers should be prepared to complete their pre-service teaching experience in diverse learning environments. Better preparing future teachers to adapt to different learning environments will aid in their success. Preparatory programs should teach how agricultural education programs are different and how their role as a pre-service teacher will change and adapt with the program. For example, a five teacher department located in urban community would differ greatly from a two teacher department located in a rural community. Pre-service teachers are just as likely to complete their pre-service teaching experience in a single teacher department or a multiple teacher department.

The preparation of future agricultural education teachers should stress the importance of teacher efficacy. They should be made aware of their teacher efficacy and how it affects their performance. It should be investigated if teacher efficacy can be strengthened prior to their pre-service teaching experience. Teacher educators should determine if there are any particular exercises or activities to aid in efficacy of pre-service teachers. Also, teacher efficacy in student engagement should also be strengthened. Pre-service teacher were most efficacious in classroom management, less efficacious with instructional strategies, and least efficacious about student engagement therefore, more preparation should be in instructional strategies and engagement of students.

Preparatory programs should also work on increasing confidence of pre-service teachers in their own abilities. Time during the teaching block should work on helping future teachers feel they are capable of teaching students. If teachers felt confident that they taught the material effectively then they tended to teach the material effectively to enhance student success.

The findings related to gender raised some interesting questions. The relationship between gender and perceived performance indicated females were less confident in their performance. In contrast, the relationship between gender and knowledge suggested females were more successful. This contrast should be further explored to determine causes of this discrepancy and evaluate the role of gender in confidence and abilities.

Confidence in future teachers including their efficacy levels and their perceived performance has shown to impact and affect student knowledge. It is imperative to instill these qualities of future teachers given the importance and impact on student success. Future teachers must be confident in their abilities as a successful educator and they should be made aware of how their confidence and efficacy impacts their success and their student success.

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Exploring Interaction Trends within Pre Service Teacher Communities of Practice during the Student Teaching Experience

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Abstract

A large library of resources is available to pre service teachers within agricultural science. The resources available to them assist in lesson planning and learning the content which they are required to teach. With the advancements in technology in our current society pre service teachers have information at their fingertips 24 hours a day. A sample population consisted of three pre service student teaching groups (fall 2007, spring 2008, spring 2009) from [a southern university] (N = 59). This study seeks to determine whether pre service teachers are utilizing the advancements in technology to network with their communities of practice (peers) and to determine how often interaction within these communities of practice takes place. Network analysis was utilized to determine the interaction trends within the communities of practice and findings show that every pre service teacher within the sample group interacted with at least one other pre service teacher within their community of practice. Furthermore, face to face communication was the most frequently utilized form of communication and technology was not used to a high degree. The frequency of the use of technology did increase from one group to the next. From the first community of practice to the last community of practice, the use of text messaging was significantly different.

Introduction/Theoretical Framework

Pre service teachers within agricultural science possess a large library of resources from which they can develop lesson plans and learn content material. In today's technologically dependent society pre service teachers have information at their fingertips 24 hours a day. Is this information helpful to them? What are the best resources that assist pre service teachers in advancing their knowledge? Can fellow pre service teachers aid each other in advancement into the agricultural education profession?

In light of our technology dependent society, pre service teachers also have access to human knowledge through their cooperating teacher, their university supervisor and through their fellow pre service teachers. The pre service teacher network consists of a group of individuals who hold a common interest but yet may come from different backgrounds and therefore have different experiences to share with their fellow pre service teachers.

The theoretical foundation of this study is rooted in the grand theory of Kolb's brain based learning model, which consists of four components; active testing, concrete experience, reflective observation and abstract hypothesis (Jensen, 2008). During their student teaching internship experience, pre service teachers are cycling through all four of Kolb's components. Active testing and concrete experience are being completed through actual teaching experiences the pre service teachers are involved with. Pre service teachers are engaged in reflective observation and the development of abstract hypotheses through conversations with their cooperating teachers, university supervisors and most importantly their fellow pre service teachers. All four components of Kolb's cycle are extremely important to the advancement of the pre service teachers.

According to Roberts, Murphy, and Edgar (2008, pp. 795-796), "the dynamic process of knowledge acquisition relies on social interactions to clarify knowledge and process experiences." The student teaching internship experience allows for pre service teachers to socially interact with a plethora of individuals; high school students, teachers, university faculty and fellow pre service teachers. The social interactions that occur during the student teaching experience affect pre service teacher behaviors (Bandura, 1977) and allow for the development of communities of practice. Communities of practice are one component of the Multimember Learning Cycle (see Figure 1) proposed by Wenger, McDermott and Snyder (2002, p. 19). The Multimember Learning Cycle depicts that learning occurs through business processes, work groups and teams or through communities of practice. Both the business processes, work groups and teams as well as the communities of practice are being guided by knowledge capital applied - *problem solving, quality assurance, leveraging* and knowledge capital stewarded - *sharing, documenting, validating* (see Figure 1) (Wenger et al., 2002). According to Wenger et al. (p.4), "communities of practice are groups of people who share a concern, a set of problems, or a passion for a topic, and who deepen their knowledge and expertise in this area by interacting on an ongoing basis." Communities of practice do not necessarily interact every day, but find great worth in the occasional interactions. Communities of practice typically share information, insight and advice about their current situations in an attempt to help solve their problems and progress in the future endeavors. In addition to information sharing, communities of practice serve as sounding boards to allow members to vent (Wenger et al.). Communities of practice can occur in both formal and non formal settings depending on the purpose of the meetings. The interaction that takes place in the learning communities serves as a reflection for the pre service teachers, thus utilizing the reflection component of Kolb's learning model.

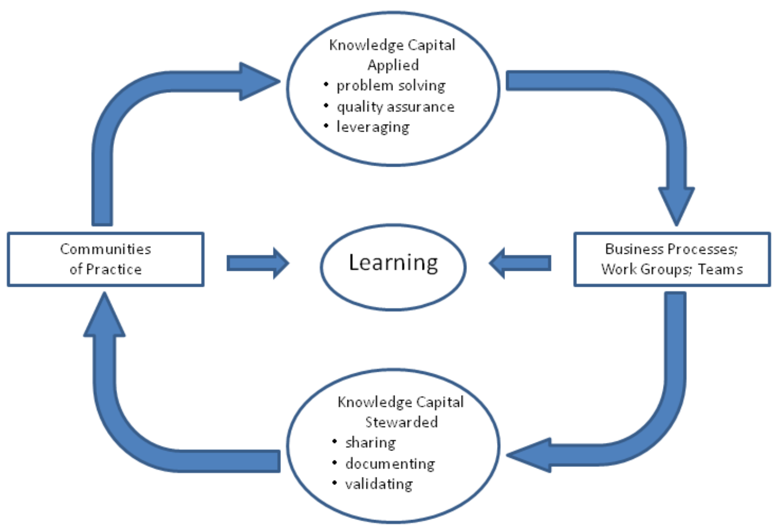

Figure 1: The Multimembership Learning Cycle (Wenger, McDermott & Snyder, 2002)

Social interactions through communities of practice allow pre service teachers to advance their knowledge, this concept is further supported by "…Bandura's social cognitive theory which postulated that individuals develop and function within many social influences instead of an isolated environment" (Roberts et al., 2008, p.796). Social network analysis (SNA) focuses on understanding the outcomes of social interactions between individuals and groups and has become a popular method of exploring the effects of human interaction (Scott, 2000; Wasserman & Faust, 1994). According to Valente (1995, p. 2), "network analysis is a technique used to analyze the pattern of interpersonal communication in a social system by determining who talks to whom." Network analysis has recently grown in popularity and in conjunction with network analysis growing, the criticisms of the analysis techniques has grown as well (Valente). The analysis of a social network is utilized to help better understand the role of personal influence on a person's behaviors.

Social interaction can occur through an array of paths. The technological advancements in social networking sites have provided quicker more convenient avenues for social interaction. Social network sites such as Facebook, My Space, Twitter and many others have made connecting with other individuals a relatively simple task. According to Roberts et al. (2008) social network sites make visible the social networks of individuals. The visibility of these individual networks can lead to "…connections between individuals that would not otherwise be made" (Roberts et al.). Email and phone contacts are still prevalent in today's society, but are becoming overshadowed by the creation and convenience of social network sites. "Web sites are critical to today's lifestyle and today's students see the Web as a valuable tool to engage in many everyday activities" (Harris & Harbstreit, 2005, p. 241). According to Howe & Strauss (2000), students in today's society, the Millennial Generation, are well versed in internet usage and have always been immersed in a technology-rich environment. Fallows (2004) found that the Millennial Generation possesses a favorable attitude in regards to the value of Internet use.

Purpose

The purpose of this study was to explore social interaction between pre service teachers during the student teaching internship experience. The study was guided by the following research questions:

1. How frequent do pre service teachers interact with their peers?
2. What methods do pre service teachers use to interact with each other?
3. Do methods of social interaction vary between different pre service teacher communities of practice?
4. Why do pre service teachers interact with their peers?
5. What are the social networking patterns of interaction between pre service teachers?

Methodology

This case study consisted of all pre service teachers from fall 2007, spring 2008, and spring 2009 semesters at Texas A & M University (N = 59) and is an extension of the study done by Roberts, Murphy, and Edgar (2008). Data were collected immediately following the twelve-week internship at a regularly scheduled face to face meeting with each group of pre service teachers.

Methods for this study closely follow the methods used in the 2008 study (Roberts et al., 2008). A researcher-developed instrument was used to assess interaction between pre service teachers. The instrument was adapted from the instrument used in the 2008 study done by Roberts et al. Face and content validity of the instrument was determined through a review by an expert panel of teacher educators not involved in the project. Because the instrument asked for recall of past behaviors, it was believed that participants could accurately and reliably provide the needed data (Dillman, 2000). Questions were written to keep "recall simple and related to the recent events" (p. 37).

The three question instrument was constructed as a matrix with all pre service teacher's names as column headers and the questions (with response options) as row headers. The first question was designed to solicit the frequency in which each student teacher interacted with each of their peers: "On Average, how often did you interact with this student teacher?" Participants were instructed to respond using an eight-point rating scale that ranged from 0 = "Never" to 7 = "Several Times a Day." The second question instructed participants to indicate all the technologies in which they communicated with each peer. Options included: Email; Text Messaging; Instant Messaging; Facebook or Myspace; Phone; and Face to Face. The third question sought to determine the reasons for which each participant communicated with each of their peers. Participants could select "Venting/Reflecting about Student Teaching", "Planning/Information – related to Student Teaching," and/or "Social/Personal – unrelated to Student Teaching."

Social networks were examined through network analysis. In network analysis, "nodes" are points on a network and "edges" are connections. In social network analysis, nodes are normally people, and edges are interactions between them. KeyPlayer is a software program that identifies optimal sets of nodes in a network for either of two purposes. The program can be used to find the set of key nodes that, if removed, would most cripple the network—would in effect 'disconnect' the greatest number of other nodes. In KeyPlayer this is called "Remove." The other purpose coded into the program, called "Observe," is to identify nodes who are "well–connected," or likely to possess a great deal of opinion leadership. Rogers (2003) would call these people opinion leaders. These two different purposes are accomplished using two different algorithms. They do not yield the same set of nodes. For this study, we employed KeyPlayer's Observe function. The goal of Observe is to find the fewest number of nodes that reach the greatest number of others. Fewer "key players" is considered good, but this is balanced against increasing the percentage of network nodes reached. Simply choosing the nodes with the greatest 'total number of connections' is not sufficient. Some people may have a great number of connections, and yet reach very few other people because they all share the same, redundant, connections or edges. So, one important point in understanding the KeyPlayer score is that it represents the number of distinct, or non–redundant, connections to others.

Within the Observe function, the researchers established some limits for this analysis. Each analysis was started by setting the number of steps, called "reach" in network analysis, to "1." A reach of 1 requires a direct link (interaction) between a key player and any other member. If the number of steps is set to 2, the measure of reach becomes the number of distinct persons who are within two links (e.g. a friend of a friend) of any member of the set of key players. This worked well for all three of the networks for which we had a "purpose." For the overall network, the reach was increased to “2” to allow for the interactions, to find the key players "between" what are essentially three networks with different purposes. The results of KeyPlayer analysis were depicted through graphical models.

For the KeyPlayer Observe analysis portion of this study, four sets of network data were created. The researchers hypothesized that there may be distinct networks, based on the purpose of the interaction. This is also consistent with Rogers’ (2003) concept of monomorphic opinion leadership; in that individuals possess opinion leadership among their peers on a limited number of topics. In contrast, polymorphic opinion leaders would possess opinion leadership on multiple topics. One overall set of network data that included all communications between pre service teachers for any purpose. A second set was created that included only those communications for reflecting or venting purposes. A third set was created that included communications only for planning of information purposes, and the fourth set included only communications the pre service teachers characterized as purely social or personal in nature. These networks were analyzed using “1” as the number of steps and group size was increased until 100% of the network was reached, or no increase in the percentage reached was realized from adding additional key players. These data are best viewed as three–dimensional Kinemages. They have been rendered into two–dimensional images for inclusion in this article.

In addition to the social network analysis, data were analyzed using the Statistical Package for the Social Sciences (SPSS 16.0) and frequencies and percentages were obtained. An ANOVA was utilized to determine if there were any significant differences between the three groups of pre service teachers’ technology usage. Frequencies, percentages, and significant differences are reported in the findings section.

Findings

Pre service teachers interacted frequently throughout their student teaching experience (M = 24.44, N = 59). The average frequency of these interactions increased from one group to the next. Group one (Fall 2007) interacted an average of 15.77 (min = 3, max = 34) times during the course of the student teaching experience. Group two (Spring 2008) interacted an average of 27.95 (min = 11, max = 48) times during the course of the student teaching experience and group three (Spring 2009) interacted an average of 31.75 (min = 13, max = 56) times throughout the student teaching experience.

Pre service teachers utilized face to face communication most often (M = 5.83, N = 59), followed by the use of the phone (M = 4.07, N = 59). The methods of interaction among the groups varied. Groups one and two were similar in their methods of interaction using face to face communication as the most common form of interaction (group one, M = 5.05; group two, M = 7.33) (see Table 1) followed by the use of the phone (group one, M = 3.59; group two, M = 3.90) to communicate (see Table 3). Group three most frequently interacted through text messaging (M = 3.52), utilizing technology to a higher degree than groups one and two (see Table 2). The second most frequently used form of interaction among group 3, was face to face communication (M = 4.94) (see Table 1) and the use of the phone (M = 4.94) (see Table 3). The least used forms of methods of communication were instant messaging and Facebook. Even though Facebook was the least used forms of social interaction it is still noted that Facebook was utilized to a higher degree by group three than groups one and two (see Table 4).

Table 1
Frequency of Face to Face Communication

				# of Times Used				
	N	M	Std. Dev.	0	1-3	4-6	7-9	9+
Group 1	22	5.05	3.124	2	7	2	0	0
Group 2	21	7.33	2.726	1	0	5	10	5
Group 3	16	4.94	5.157	0	9	2	4	1

Table 2
Frequency of Text Messaging as Communication

				# of Times Used				
	N	M	Std. Dev.	0	1-3	4-6	7-9	9+
Group 1	22	1.55	2.017	9	9	3	1	0
Group 2	21	3.52	2.676	3	9	6	3	0
Group 3	16	5.31	2.960	1	3	7	4	1

Table 3

Frequency of Phone Communication

				# of Times Used				
	N	M	Std. Dev.	0	1-3	4-6	7-9	9+
Group 1	22	3.59	2.443	2	10	6	4	0
Group 2	21	3.90	2.406	0	10	7	3	1
Group 3	16	4.94	2.645	1	4	6	5	0

Table 4
Frequency of Facebook as Communication

				# of Times Used		
	N	M	Std. Dev.	0	1-3	4-6
Group 1	22	0.45	1.057	17	4	1
Group 2	21	0.67	1.017	12	8	1
Group 3	16	1.31	1.401	6	8	2

Pre service teachers interacted for a variety of purposes. Between all three groups 98.3% (N = 58) of the pre service teachers interacted for planning or informational purposes, 93.2% (N = 55) interacted to vent and 91.5% (N = 54) of the pre service teachers interacted for social purposes. After running an ANOVA test to compare the three groups of respondents it was discovered that there is a significant difference (p = .000) in the use of text messaging between the groups. The results of the REGWF post hoc test showed that all three groups were significantly different in their text messaging usage. The results of the ANOVA test also indicated that there was a significant difference in the purposes for interaction. The results of the ANOVA test showed that the difference lies within venting (p = .013) as a reason for interaction. The results of the REGWF post hoc test showed that groups one and three were similar in their frequency of interaction for purposes of venting and group two was significantly different.

Based on the data collected, graphical interaction models were developed to explain the interconnectedness of pre service teachers. Models are presented below to show social networking patterns of the pre service teachers during their student teaching internship experience. When examining the overall social networking patterns of the three respondent groups: group one (Fall 2007) possessed four key players (pre service teachers 3, 4, 7 and 16) reaching 90.9% of the group; group two (Spring 2008) possessed three key players (pre service teachers 6, 8 and 18) reaching 97.6% of the group; and group three (Spring 2009) possessed one key player (student teacher 5) reaching 96.9% of the group.

In group one key player 3 did not interact with the other key players, but interacted with pre service teachers 14, 18, 19, 20 and 22; key player 4 interacted with key player 16 along with pre service teachers 1, 2, 5, 9, 6, 12, 13, 15, 18, and 20; key player 7 interacted with key player 3 along with pre service teachers 5, 9, 10, 15, and 22; and key player16 interacted with key player 4 along with pre service teachers 1, 2, 5, 8, 10, 11, 12, 13, 14, 15, 17 and 20 (see Figure 1).

When examining the patterns of interactions for group one, no single student teacher interacted with all four key players. Pre service teachers 5, 15, and 20 and interacted with three of the four key players and pre service teachers 1, 2, 9, 10, 12, 13, 14, 18, and 22 interacted with two of the four key players (see Figure 1). When examining patterns of interaction for planning and information (PI), venting and reflection (VR), and social and personal (SP) pre service teachers 5 and 15 were key players for PI, pre service teachers 1, 3, and 18 were key players for VR, and pre service teachers 1, 2, and 19 were key players for SP. When comparing the interaction trends of all areas student teacher 3 was a key player overall as well as a key player for VR and student teacher 1 was a key player for both VR and SP.

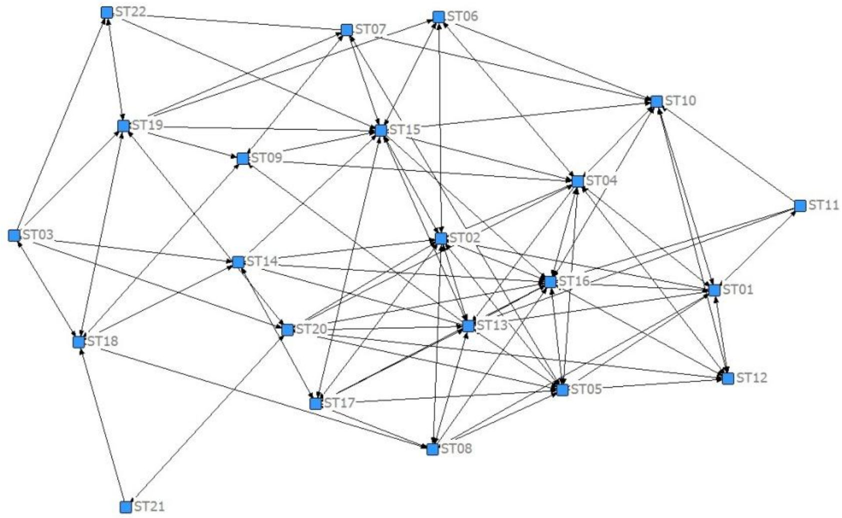

Figure 1. Social Networking Patterns of Student Teaching Group One (Fall 2007)

In group two key player 6 had no interaction with key players 8 and 18 but had interaction with pre service teachers 1, 2, 3, 5, 7, 11, 16, 17 and 20; key player 8 interacted with key player 18 along with pre service teachers 1, 3, 4, 5, 12, 14, 15, 16, 17, 19, 20 and 21; and key player 18 interacted with key player 8 along with pre service teachers 1, 2, 4, 5, 9, 10, 12, 13, 15, 16, and 19 (see Figure 2).

When examining the patterns of interactions in group two, key player 6 had no interaction with the other players but had interaction with seven other pre service teachers who interacted with key players 8 and 18. Additionally, pre service teachers 1, 5 and 16 interacted with all three key players and 2, 3, 12, 15, 19, and 20 interacted with at least two of the key players. When examining patterns of interaction for PI, VR, and SP student teacher 9 was the key player for PI, pre service teachers 2 and 19 were key players for VR, and pre service teachers 16 and 19 were key players for SP. When comparing the interaction trends of all areas no overall key players were key players in the other areas. Student teacher 19 was the only student teacher who was a key player in more than one area (VR and SP).

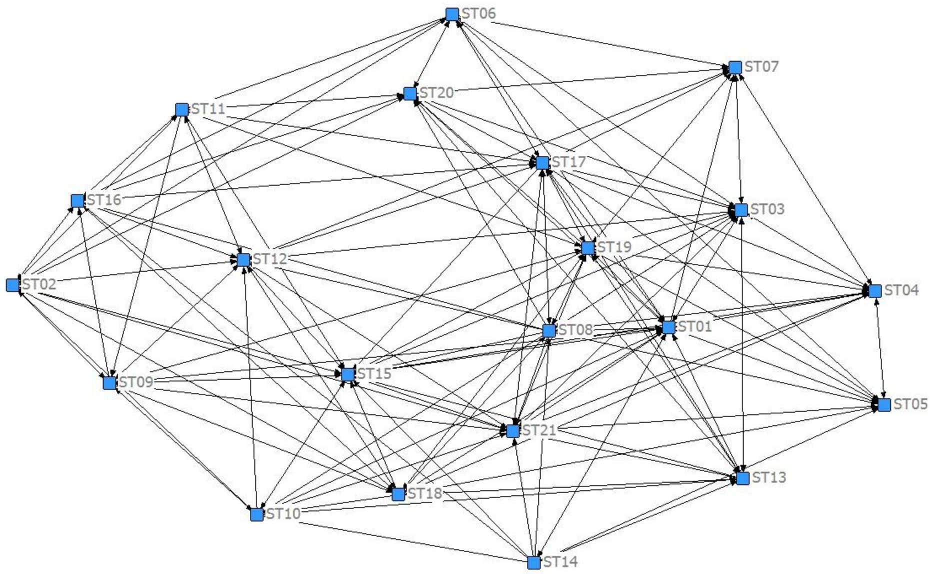

Figure 2. Social Networking Patterns of Student Teaching Group Two (Spring 2008).

In group three, key player 5 interacted with all the other pre service teachers except student teacher 14, but student teacher 14 interacted with eight of the other pre service teachers (see Figure 3). When examining patterns of interaction for PI, VR, and SP pre service teachers 6 and 12 were the key players for PI, pre service teachers 6, 8, 11, and 19 were key players for VR, and pre service teachers 6, 11, and 2 were key players for SP. When comparing the interaction trends of all areas the overall key player (student teacher 5) was not a key player in the other areas. Student teacher 6 was the only student teacher who was a key player in PI, VR, and SP. Student teacher 11 was a key player in both VR and SP.

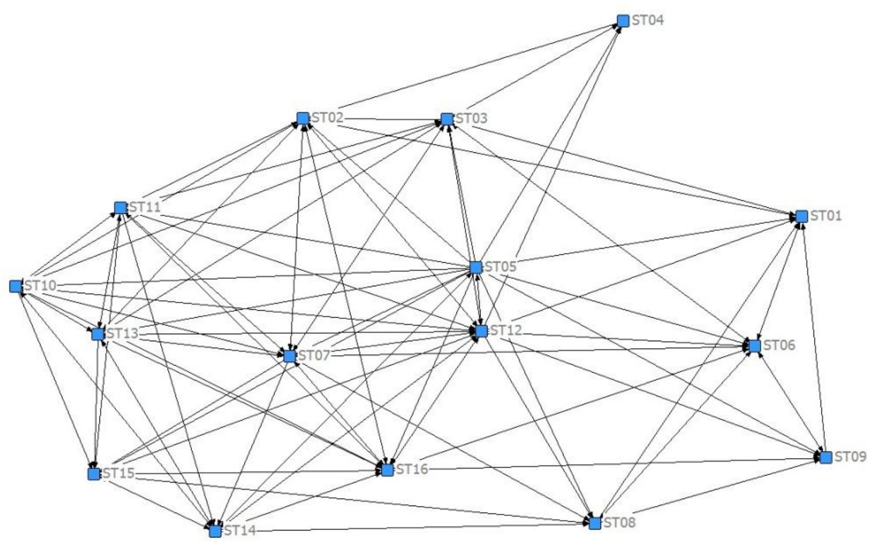

Figure 3. Social Networking Patterns of Student Teaching Group Three (Spring 2009)

Conclusions, Recommendations and Implications

The groups of pre service teachers in this study are interacting more frequently with one another each semester. All methods of communication other than face-to-face meetings, to include texting, phone, and Facebook have increased over time. This increased frequency of interaction, across all methods of communication, may simply indicate that these agricultural science pre service teachers are part of the widely-accepted cultural phenomenon called the connected generation. Interestingly, the connected generation is generally perceived as communicating through technology, most frequently through text messaging and social networking sites. The pre service teachers in this study had been primarily communicating face-to-face, but the groups are statistically different and increasing in their use of text messaging. This most recent group reported fewer face-to-face meetings and more frequent use of text messaging and Facebook.

In examining patterns of communication among these groups of pre service teachers, the overall patterns of connectedness and influence are dynamic. Similar to the findings reported in Roberts et al. (2008), every pre service teacher interacted with a peer during the student teaching experience. Unlike the 2007 and 2008 groups, when three of four individuals were identified as overall Key Players, a single person was identified as the Key Player in 2009. In networks with this pattern, failing to communicate with that person would dramatically slow the rate and effectiveness of communications.

When examining the reasons for interaction, this single Key Player in 2009, was monomorphic (Rogers, 2003) in his leadership, only surfacing as a Key Player in the social/personal category. Therefore, the researchers conclude that this Key Player was responsible for the organization of a majority of the social activities amongst the pre service teacher group. When examining the other categories, other pre service teachers were identified as Key Players in the planning/information and the venting/reflection categories, but were not Key Players overall. This result supports the findings of the work done by Roberts et al. (2008), indicating that the pre service teachers interacted with small networks of three to five peers dependent on the purpose of the interaction.

Pre service teachers in this study continue to select Key Players for specific purposes, lending credence to Rogers' (1995) concept of the importance of perceived expertise on opinion leadership. Among the groups of pre service teachers in this study, most opinion leaders are monomorphic. In networks with monomorphic opinion leaders, attempts to increase the effectiveness of communications require that the channel of communication be tailored depending on the purpose of the message. Although most pre service teachers were monomorphic, a few pre service teachers also emerged as polymorphic opinion leaders but did not emerge as an overall Key Player, supporting the idea that those particular opinion leaderships were Key Players within their small networks, but not amongst the entire group. Researchers conclude that pre service teachers interact within small networks more frequently than with the larger group of peers.

In 2007, a single student teacher was found to be essentially isolated; no isolates were found in 2008 or 2009. Over the past couple years; the teacher educators have been sensitive to assigning pre service teachers who may be social isolates to cooperating teaching sites with more than one student teacher. This practice appears to be working.

The exploratory nature of this research provides limited implications for practice, but generates questions for further inquiries. The following are offered for further research:

1. The results of this study show that pre service teachers in agricultural science are adapting their communication methods over time as technology changes in our society. But the question still remains as to whether the pre service teachers are changing quickly enough with the times to better serve the students that they will be educating. The authors recommend that further studies be conducted to determine the technological aptitude of the pre service teachers in agricultural science.

2. The patterns of connectedness among pre service teachers are socially constructed and appear to be related to the purpose of the communication. The authors recommend that additional research be done to explore the importance of social connectedness in learning.

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A Descriptive Interpretive Analysis of Students' Oral Verbalization During the Use of Think-Aloud Pair Problem Solving While Troubleshooting

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Abstract

Researchers have asserted that the metacognitive nature of think-aloud pair problem solving (TAPPS) improves students' problem solving by focusing their attention on their own thinking. The purpose of this study was to identify and describe oral verbalizations indicating cognitive processes of secondary-level career and technical education students who used TAPPS while troubleshooting. A qualitative interpretive approach was used to describe and interpret students' thoughts while they were engaged in TAPPS. A quantitative analysis was used to compare levels of oral verbalization between successful and unsuccessful TAPPS students. The total average percentage of oral verbalizations indicating metacognitive thought was 54% for successful students and 52% for unsuccessful students. These rates indicate that TAPPS focuses secondary-level students' thinking toward a process-oriented approach during troubleshooting. The content of students' oral verbalizations revealed that the metacognitive nature of the TAPPS strategy does not improve problem-solving success when secondary-level career and technical education students do not possess enough domain-specific knowledge. It is recommended that prior to implementation of the TAPPS strategy instructors should insure students possess the prerequisite domain specific knowledge needed for troubleshooting small engines.

Introduction

Instructional efforts have focused on developing students' abilities to solve real-world problems (Technology for All Americans Project, 1996). Hill (1997) stated, "It is imperative that professionals in the field incorporate problem solving concepts and strategies as a significant element in curriculum design and implementation" (p. 32). Research has led to the development of several techniques that have shown promise for improving student problem solving (Dunlosky & Metcalfe, 2009).

One technique that has shown promise for improving students' problem solving is the use of questioning to invoke self-explanations. Pasher et al. (2007) recommended that teachers find opportunities to have students ask and answer questions to promote explanations that are metacognitive in nature. Because metacognition often occurs as an internal dialogue, many students may be unaware of its importance unless it is overtly taught (National Research Council, 2000). It is reasonable to assume that individuals could develop this internal dialogue through training and instruction (Borkowski, Chan, & Muthukrishna, 2000; Cardelle-Elawar, 1995; Pintrich, 2002; Schraw, 1998).

Theoretical Framework

The theoretical framework for this study revolves around problem solving, the role of metacognition, the impact of verbalization on thinking, and TAPPS.

Problem Solving
An individual encounters a problem when an obstacle interferes with achieving a situational goal (Marzano & Kendall, 2007). Davidson, Deuser, and Sternberg (1994) described problem solving as “the active process of trying to transform the initial state of a problem into the desired one” (p. 207-208). This behavior is characterized by identification, evaluation, and utilization of potential solution paths that would accomplish the desired end result.

Metacognition
The ability to monitor and control one’s thinking to accomplish a desired goal is central to metacognition (Dunlosky & Metcalfe, 2009). Typical directed thinking involves isolating a solution path to achieve a clear goal (Kellogg, 2007). “Metacognition guides the problem-solving process and improves the efficiency of this goal-oriented behavior” (Davidson et al., 1994, p. 207). According to Davidson et al., metacognition aids problem solving by helping an individual focus on identifying the problem, defining the problem space, generating a mental representation of the problem, planning how to proceed, and evaluating what is known about their own performance.

Another critical element of metacognition is self-assessment of one’s own thinking (Kluwe, 1982). A problem solver’s assumptions regarding their inabilities to solve a problem may serve as a barrier to success. If students believe they are awful problem solvers, they may make fewer attempts to monitor and regulate their thinking, which in turn, may lower the number of solutions examined (Hacker, 1998).

Oral Verbalization
Hacker and Dunlosky (2003) suggested that having students explain their thoughts during problem solving through oral verbal reports helps invoke metacognitive thinking. Research supports the use of self-explanations as a strategy for improving student problem-solving performance (Ahlum-Heath & Di Vesta, 1986; Berry, 1983, Stanley, Mathews, Buss, & Kotler-Cope, 1989; Stinessen, 1985). Berardi-Coletta, Buyer, Dominowski, and Rellinger (1995) found that students who gave reasons for their actions during problem solving performed superior to students who were silent, asked to talk aloud, or asked problem-focused questions. Berardi-Coletta et al. stated that the improved performance was due to a shift in students’ focus from problem-oriented to process-oriented thinking.

Think-aloud Pair Problem Solving
TAPPS is a method for invoking oral verbalization during problem solving with the goal of developing the problem solver’s ability to monitor their thoughts (Gourgey, 1998). The TAPPS procedure involves a student solving a problem while a listener asks questions to prompt the student to verbalize their thoughts and clarify their thinking (Lochhead, 2000). This type of reflective thinking is an essential component of metacognition. Researchers assert that the metacognitive nature of the TAPPS method improves students’ problem solving by focusing their attention on their own thinking (Berardi-Coletta et al., 1995; Heiman & Slominako, 1987; Pate, Wardlow, & Johnson., 2004; Whimbey & Lochhead, 1984).

Using TAPPS during troubleshooting has significantly increased postsecondary career and technical education students’ success at solving technical problems (Johnson & Chung, 1999;

Pate et al., 2004). This indicates that students who concentrate on explaining their thinking should be more successful at solving similar problems, such as troubleshooting a small gasoline engine fault. Students may have difficulty successfully focusing their verbalization on problem-oriented features rather than actively clarifying their own thinking. Students' negative self-assessment of their thinking may inhibit their success. The cognitive impact of TAPPS oral verbalization during troubleshooting is uncertain. Are TAPPS students' verbalizations conducive to improving their problem-solving abilities?

Purpose

The purpose of this study was to identify and describe oral verbalizations indicating cognitive processes of secondary-level career and technical education students who used TAPPS while troubleshooting.

Methodology

Research Design

The data source for this study was digital audio recordings of 16 secondary-level career and technical education students from four Iowa secondary schools who engaged in TAPPS during a troubleshooting task. This study incorporated a mixed-methods approach. A qualitative interpretive approach was used to describe and interpret students' thoughts while they were engaged in TAPPS. A quantitative analysis was used to compare levels of oral verbalization between successful and unsuccessful TAPPS students.

Procedure

Students were asked to use the TAPPS approach while troubleshooting a compression fault involving a missing valve spring retainer in a small engine. Prior to the experiment, the researcher provided each student with identical instruction regarding domain-specific knowledge on troubleshooting small gas engines via a protocol adapted from Webster (2001). Students received information on the three major systems required for an engine to operate: compression, ignition, and air/fuel intake. No hints were given to the students, but they were told the fault did not involve removal of the cylinder head or crankcase cover. This was provided to prevent students from completely disassembling the engine. Each problem solver was provided with a complete set of basic engine repair tools and a 35-minute period in which to identify the correct fault, identify the correct engine system affected, and correctly describe how to repair the fault. Ericsson & Simon's (1993) techniques guided recording, transcription, and analysis of the verbal protocols. Each student was equipped with a digital voice recorder and an attached lapel microphone. Each problem solver was randomly assigned a listener. Each listener was trained on the technique required for questioning. The researcher explained the TAPPS procedure to the listeners and provided a list of sample questions. Listeners were asked to encourage problem solvers to verbalize their thoughts without giving any hints or assisting the problem solver in finding a solution. Whenever the problem solver was quiet for a few seconds, the listener asked for verbalization by asking a question about their progress. Listeners also asked for clarification whenever they were unsure of how the problem solver was thinking and pushed for greater detail in the verbalized thoughts by asking a question. Prior to troubleshooting, students assigned to the problem solver role completed a TAPPS practice session with an unrelated word problem.

The practice task was designed to ensure problem solvers could verbalize their thoughts at an adequate level but was sufficiently dissimilar so as not to introduce bias into students' oral verbal reports during the troubleshooting task.

A volunteer was recruited to assist with transcript analysis. The lead researcher transcribed the recordings of the TAPPS students and then listened to the recordings to identify any errors in the transcripts. To ensure credibility of the transcripts, the research assistant also reviewed the transcripts and compared them with the audio recordings. The lead researcher instructed the research assistant on how to code the transcripts. The lead researcher and research assistant independently coded each transcript. Coded transcripts were compared to determine inter-rater reliability. There was 87% agreement between the lead researcher and research assistant. After 4 days, five transcripts were randomly selected to be recoded by the researcher and research assistant. Intra-rater reliability for the researcher was 92%. Intra-rater reliability of the research assistant was 90%. Transcripts coded by the lead researcher were used for analysis.

Responses from the problem solver were coded as level-one, level-two, or level-three verbal statements. Level-one verbalizations were statements describing contents of working memory. These included descriptions of representing the problem or reporting concurrent behavior. Level-two verbalizations were statements describing nonverbal sensory information. Level-three verbalizations were statements involving planning, monitoring, and evaluating.

The code negative self-assessment was given to students' statements directed at judging themselves as performing poorly. The code positive self-assessment was given to students' statements directed at judging themselves as performing well. The code positive problem assessment was given to students' statements directed at judging the activity positively. The code negative problem assessment was given to students' statements directed at judging the activity negatively. The code not on task was used for student verbalizations consisting of information irrelevant to solving the problem.

Analysis

The number of oral verbalizations at each level per student was tabulated for students who were successful and unsuccessful at the troubleshooting task and then analyzed with descriptive statistics including frequencies and percentages. Transcripts were used to develop common themes for students' cognitive processes.

Results/Findings

Quantitative Data

Sixteen secondary-level career and technical education students used TAPPS while troubleshooting a small gas engine compression system fault. Four of the 16 students were successful at troubleshooting the compression system fault. Average time to completion for successful students was 15 minutes (SD = 6.7). Unsuccessful students spent an entire class period attempting to troubleshoot the engine fault. Work times ranged from 30 to 35 minutes in length with an average of 31.2 minutes (SD = 2.7).

Table 1 shows frequencies and percentages of oral verbalizations for successful secondary-level career and technical education students who used TAPPS. The average total number of verbalizations for successful students was 66 (*SD* = 32.7). The average rate of oral verbalizations per minute for successful students was 4.4 (*SD* = 1.0). Table 2 shows frequencies and percentages of oral verbalizations for unsuccessful secondary-level career and technical education students who used TAPPS. The average total number of verbalizations for unsuccessful students was 120 (*SD* = 56.1). The average rate of oral verbalizations per minute for unsuccessful students was 3.8 (*SD* = 1.5). Of all unsuccessful students, student H had higher rates of oral verbalizations in all categories except level-three negative self-assessment, level-three positive self-assessment, level-three negative problem assessment, and level-three positive problem assessment. When student H was removed from the data set, the average total number of oral verbalizations given by unsuccessful students was 105 (*SD* = 27.0) and the average rate of oral verbalizations per minute given by unsuccessful students was 3.4 (*SD* = 0.8). Patterns of verbalizations in Tables 1 and 2 were relatively equal when completion time was accounted for. Level-one working memory, level-three planning, level-three monitoring, and level-three evaluating accounted for the majority of oral verbalizations.

Averages for the percentages of oral verbalizations by group are shown in Table 3. Successful students had slightly higher percentages of oral verbalizations in the categories of level-one working memory, level-two nonverbal sensory information, level-three planning, and level-three evaluating. There were differences between unsuccessful and successful students in the standard deviations for the categories of level-three planning, level-three monitoring and level-three evaluating. Successful students had a higher standard deviation (9.1) for level-three planning oral verbalizations than unsuccessful students (*SD* = 4.1). Successful students also had a higher standard deviation (8.0) for level-three monitoring oral verbalizations than unsuccessful students (*SD* = 5.5). Successful and unsuccessful students had similar standard deviations for level-one working memory oral verbalizations. Unsuccessful students had higher percentages of oral verbalizations in the categories of negative self-assessment, negative problem assessment, and not on task.

Table 1.
Frequencies and percentages of oral verbalizations for successful students who used think-aloud pair problem solving

Student	L1	L2	L3P	L3M	L3E	L3NSA	L3PSA	L3NPA	L3PPA	NOT	Total
A	31 (33.7%)	0 (0.0%)	6 (6.5%)	18 (19.5%)	32 (34.8%)	1 (1.1%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	4 (4.3%)	92 (100.0%)
D	19 (33.9%)	1 (1.8%)	6 (10.7%)	11 (19.6%)	16 (28.6%)	2 (3.6%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	1 (1.8%)	56 (100.0%)
I	11 (45.8%)	2 (8.3%)	0 (0.0%)	4 (16.7%)	6 (25.0%)	0 (0.0%)	1 (4.2%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	24 (100.0%)
J	45 (48.9%)	0 (0.0%)	20 (21.7%)	3 (3.3%)	24 (26.1%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	92 (100.0%)

Note. L1 = level-one working memory, L2 = level-two nonverbal sensory information, L3P = level-three planning, L3M = level-three monitoring, L3E = level-three evaluating, L3NSA = negative self-assessment, L3PSA = positive self-assessment, L3NPA = negative problem assessment, L3PPA = positive problem assessment, NOT = not on task.

Table 2.
Frequencies and percentages of oral verbalizations for unsuccessful students who used think-aloud pair problem solving

Student	L1	L2	L3P	L3M	L3E	L3NSA	L3PSA	L3NPA	L3PPA	NOT	Total
B	32 (31.7%)	0 (0.0%)	9 (8.9%)	17 (16.8%)	36 (35.6%)	4 (4.0%)	1 (1.0%)	2 (2.0%)	0 (0.0%)	0 (0.0%)	101 (100.0%)
C	43 (40.6%)	0 (0.0%)	13 (12.3%)	22 (20.8%)	28 (26.4%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	106 (100.0%)
E	42 (43.8%)	1 (1.0%)	6 (6.3%)	19 (19.8%)	23 (24.0%)	1 (1.0%)	0 (0.0%)	3 (3.1%)	0 (0.0%)	1 (1.0%)	96 (100.0%)
F	36 (27.9%)	2 (1.6%)	19 (14.7%)	21 (16.3%)	33 (25.6%)	2 (1.6%)	0 (0.0%)	6 (4.7%)	0 (0.0%)	10 (7.8%)	129 (100.0%)
G	28 (26.7%)	1 (1.0%)	11 (10.5%)	31 (29.5%)	32 (30.5%)	0 (0.0%)	0 (0.0%)	2 (1.9%)	0 (0.0%)	0 (0.0%)	105 (100.0%)
H	109 (38.9%)	17 (6.1%)	21 (7.5%)	42 (15.0%)	60 (21.4%)	0 (0.0%)	1 (0.4%)	7 (2.5%)	0 (0.0%)	23 (8.2%)	280 (100.0%)
K	39 (30.2%)	2 (1.6%)	2 (1.6%)	33 (25.6%)	38 (29.5%)	7 (5.4%)	0 (0.0%)	6 (4.7%)	0 (0.0%)	2 (1.6%)	129 (100.0%)

Table 2 (*continued*)

Student	L1	L2	L3P	L3M	L3E	L3NSA	L3PSA	L3NPA	L3PPA	NOT	Total
L	40 (42.1%)	0 (0.0%)	12 (12.6%)	19 (20.0%)	20 (21.1%)	2 (2.1%)	0 (0.0%)	1 (1.1%)	1 (1.1%)	0 (0.0%)	95 (100.0%)
M	51 (34.9%)	1 (0.7%)	17 (11.6%)	25 (17.1%)	27 (18.5%)	4 (2.7%)	0 (0.0%)	16 (11.0%)	0 (0.0%)	5 (3.4%)	146 (100.0%)
N	42 (50.0%)	0 (0.0%)	14 (16.7%)	9 (10.7%)	17 (20.2%)	1 (1.2%)	0 (0.0%)	1 (1.2%)	0 (0.0%)	0 (0.0%)	84 (100.0%)
O	54 (46.2%)	2 (1.7%)	8 (6.8%)	12 (10.3%)	18 (15.4%)	3 (2.6%)	6 (5.1%)	1 (0.9%)	0 (0.0%)	13 (11.1%)	117 (100.0%)
P	26 (52.0%)	1 (2.0%)	4 (8.0%)	9 (18.0%)	8 (16.0%)	1 (2.0%)	0 (0.0%)	1 (2.0%)	0 (0.0%)	0 (0.0%)	50 (100.0%)

Note. L1 = level-one working memory, L2 = level-two nonverbal sensory information, L3P = level-three planning, L3M = level-three monitoring, L3E = level-three evaluating, L3NSA = negative self-assessment, L3PSA = positive self-assessment, L3NPA = negative problem assessment, L3PPA = positive problem assessment, NOT = Not on task.

Table 3.
Average percentages of oral verbalizations by group

	Successful		Unsuccessful	
Code	*M*	*SD*	*M*	*SD*
L1	40.6	7.9	38.7	8.5
L2	2.5	4.0	1.3	1.7
L3P	10.0	9.1	9.8	4.1
L3M	15.0	8.0	18.3	5.5
L3E	29.0	4.4	23.7	6.1
L3NSA	1.2	1.7	2.0	1.7
L3PSA	1.0	2.1	0.5	1.5
L3NPA	0.0	0.0	3.0	3.0
L3PPA	0.0	0.0	0.1	0.3
NOT	1.5	2.1	3.0	4.0

Note. L1 = level-one working memory, L2 = level-two nonverbal sensory information, L3P = level-three planning, L3M = level-three monitoring, L3E = level-three evaluating, L3NSA = negative self-assessment, L3PSA = positive self-assessment, L3NPA = negative problem assessment, L3PPA = positive problem assessment, NOT = not on task.

Qualitative Data

Level-one working memory oral verbalizations. Most often students' level-one working memory verbalizations described their actions as they removed or returned parts to the engine. When describing their actions, successful student A and three unsuccessful students (E, K, and B) failed to use correct engine terminology to describe the engine parts. Successful student A stated, "Taking off ssss hold on I don't know what it is yet but I'm taking it off." Unsuccessful student E stated, "I'm gonna take off the something I don't know what it's called so yeah taking this thing off."

Level-two nonverbal sensory information oral verbalizations. There were no differences in content of level-two nonverbal sensory information oral verbalizations between successful and unsuccessful students. Across groups, level-two nonverbal sensory information verbalizations revealed sensations in smell that were attended to by students during troubleshooting. Successful student D stated, "Ugh that smells." Unsuccessful student H stated, "Smells good."

Level-three planning oral verbalizations. Students' level-three planning verbalizations were directed toward the order of tests to be made to the engine. When planning their next test, students described what they would do with little explanation for why they planned to conduct those tests. Unsuccessful student L stated, "Ah, check compression first, okay." Unsuccessful student F stated, "So, we're going to start off by taking these bolts off here." Successful student J started troubleshooting by checking the spark plug gap without first identifying if a fault existed in the ignition system. Unsuccessful student C commented that it seemed to have pretty good compression so the next thing to check was spark. When the listening partner asked, "What are you doing now?" Unsuccessful student F stated, "I'm gonna check for spark in the spark plug and make sure we've got that."

Level-three monitoring oral verbalizations. The content of level-three monitoring oral verbalizations given by students revealed shallow analysis of possible solutions. Students did not analyze the results of their tests before moving randomly to check other engine components. Successful student J stated, "I was going to check the armature gap because it seem to have a real easy pull but it still has compression so I had to check armature gap to make sure we were get'n enough through." Unsuccessful student C remembered to check valve springs but upon examination determined nothing was wrong with them. Unsuccessful student C stated, "Err look at the valve springs really quick just to see if anything is wrong there with the valve springs look good, there's nothing abnormal about them." Unsuccessful student C's listening partner asked, "How do you know that something's not wrong with those?" In response, unsuccessful student C stated, "Ah um they look pretty normal they didn't look anything out of the ordinary so just by the eye they looked fine to me." Afterward, unsuccessful student C's listening partner asked, "Could they be warped or disfigured if something was wrong?" Unsuccessful student C replied, "Yeah, they would but if they, they look pretty good to me."

Level-three evaluating oral verbalizations. Unsuccessful students' level-three evaluating verbalizations indicated a lack of knowledge regarding the troubleshooting procedure and the functions of engine components. Unsuccessful student P stated, "Alright, then compression, crap I forgot what the other one's were alright, compression, crap something else and then the carburetor." Four unsuccessful students (F, L, N, and M) identified compression as the fault area but failed to identify a solution. Of these four students, two (M and F) verbalized that they could not remember what to check for compression. Unsuccessful student M stated, "I don't even remember everything we're supposed to check for compression, so, if, I can't even remember what to check there's no way I can get it fixed." Unsuccessful student F stated, "There's like no compression… I can't even remember. Probably check to see if there's any spark, I've already checked the gas and there's gas in there right now already, so I've got that covered." Successful students' level-three evaluation verbalizations were focused on making judgments relevant to the cause of the engine fault based on the result of their engine test. Successful student I stated, "Ah, the compression system is wrong; the intake doesn't look to be moving." Successful students often verbalized about what they had learned from working with the engine. These students made note of problem characteristics and related them to what they had learned. Successful student J stated, "Well, I don't know how I'm suppose to fix it, but I think I figured the problem out, um the spring doesn't seem to be seated right, um, I'm not sure what I'd do to fix springs, the other one has a gap right there… It doesn't seem to be compressed, um make it so it would be compressed."

Level-three negative self-assessment, level-three negative problem assessment, and not on task oral verbalizations. Negative self-assessment, negative problem assessment, and not on task verbalizations generally were given by unsuccessful students. Unsuccessful student

K stated, "I feel like a retard." Three unsuccessful students (K, M, and O) explained they did not like being recorded while they were working. Unsuccessful student M stated, "Umm, cause I don't like this talking through it, I'm not a talker anyway." Unsuccessful student B stated, "Thinking I'm probably didn't get this and I'm going to be the one failure in the class." Two students (E and H) seemed to view the activity as irrelevant to them. Unsuccessful student E stated, "…this is stupid I really don't care about these stupid engines..." Unsuccessful students often verbalized about irrelevant information characteristic of being not on task. These verbalizations often focused on activities of the day or other student events. Unsuccessful student H stated, "Subway eat fresh, ha ha we're talking about random bull."

Conclusions/Recommendations/Implications

When work time was accounted for, verbalization rates between unsuccessful and successful students were similar in all oral verbalization categories except level-three negative-self assessment, level-three negative problem assessment, and not on task. Successful students had no level-three negative problem assessment, whereas unsuccessful students had an average of three verbalizations for level-three negative problem assessment. Also, unsuccessful students gave almost two times the amount of negative self-assessment verbalizations as successful students. This could have been caused by students' frustration with not finding a solution toward the end of their troubleshooting activity. On average, unsuccessful secondary-level career and technical students gave twice the amount of not on task verbalizations as successful students. This can be explained by the number of not on task verbalizations given by unsuccessful students F, H, and O. These students' not on task oral verbalizations averaged 9% of their total oral verbalizations. The remaining unsuccessful students' not on task oral verbalizations averaged only 0.7% (SD = 1.2) of their total oral verbalizations. The total average percentage of oral verbalizations across the level-three planning, monitoring, and evaluating categories was 54% for successful students and 52% for unsuccessful students. These rates indicate that TAPPS focuses secondary-level students' thinking toward a process-oriented approach during troubleshooting.

However, the content of students' oral verbalizations indicates the metacognitive nature of the TAPPS strategy does not improve problem-solving success when secondary-level career and technical education students do not possess enough domain-specific knowledge. Unsuccessful students' verbalizations in the level-three monitoring and evaluating categories often were concerned with their level of knowledge regarding troubleshooting and small engines. These students had difficulty remembering the troubleshooting process and the proper functions of engine components. Unsuccessful secondary-level career and technical education students verbalized negatively about their ability or performance and the troubleshooting activity. A majority of level-three evaluating statements from unsuccessful students focused on assessing their knowledge of engine principles and troubleshooting. Unsuccessful students described their level of knowledge as low or nonexistent. In contrast, the content of successful students' level-three evaluating verbalizations focused on making judgments in relation to their monitoring of the effects of their engine tests and their evaluation of engine fault symptoms.

Students' concerns about their knowledge level could be connected to their rate of troubleshooting success. Davidson et al. (1994) observed that amount and quality of a problem solver's domain-specific knowledge can be a limiting factor in their ability to reach a solution. An implication is that students' knowledge level could be connected to the amount of instruction they receive and the difficulty of the troubleshooting activity. All secondary-level students in this study received only one class period of troubleshooting instruction. Students were given notes and a demonstration on how to troubleshoot the air/fuel delivery, ignition, and compression systems. Students were told the engine needed all three systems to function correctly in order to run, and possible faults for each system were described to the students. To complete the troubleshooting activity, students had to identify the system at fault, identify the specific engine component that was malfunctioning, and correctly describe the appropriate repair. However, secondary-level students' knowledge of basic engine principles and operating theory was not formally assessed prior to this study. Analysis of the qualitative data indicates that students' domain-specific knowledge was not strong enough to support troubleshooting. It is recommended that prior to implementation of the TAPPS strategy instructors should insure students possess the prerequisite domain specific knowledge needed for troubleshooting small engines. Although this exploratory study offers no support for using TAPPS at the secondary level, the reader is cautioned against making generalizations from this relatively small sample of 16 students. This study does not rule out the possibility that TAPPS could be useful with other secondary-level students, and we strongly recommended that future research incorporate a larger sample size.

Lochhead (2001) pointed out that the goal of TAPPS is the eventual development of students' ability to observe and control their cognitive behavior, but Glaser (1984) argued that transfer of thinking habits from using general strategies like TAPPS is limited because of a lack of a direct connection between thinking and problem solving during learning. Perkins, Simmons, and Tishman (1990) argued that general cognitive strategies have potential to be helpful in teaching problem solving but only with deliberate effort. Salomon and Perkins (1989) concluded that the lack of transfer in thinking habits taught in general cognitive strategies is linked to the reliance on automatic triggering through practice rather than thoughtfully detaching strategies from one context and applying them to another. Thus, implementation of the TAPPS strategy should be modified for use with secondary-level career and technical education students. Perkins et al. suggested contextualizing instruction of general cognitive strategies by teaching them in the target domain with vocabulary adjusted to suit the target domain. An implication for future research would be to determine the effect of allowing secondary-level students to practice using TAPPS with an engine problem before being tested.

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The Impact of Inquiry-Based Learning on the Academic Achievement of Middle School Students

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Abstract

With the institution of *No Child Left Behind* and an emphasis on high-stakes testing, teachers are becoming more and more accountable for student academic achievement. The purpose of this study was to identify the impact of using inquiry-based, or constructivist, curriculum in a middle school classroom on student academic achievement. The study was developed to determine which teaching method, constructivism or traditionalism, was more effective in increasing student academic achievement. In this research study, the data showed that using inquiry-based, or constructivist, curriculum in the middle school classroom appeared to have an impact on student academic achievement. It showed that constructivism, as compared with traditionalism, appeared to be more effective in increasing student academic achievement within a unit of instruction.

Introduction-Theoretical Framework

With the institution of *No Child Left Behind* and an emphasis on high-stakes testing, teachers are becoming more and more accountable for student academic achievement. Teachers across the nation are looking for ways to increase student performance on formal assessment. For many teachers, the traditional ways of teaching are not producing the desired results. Teachers are now looking toward other methods, such as constructivism, to increase achievement.

The National Science Education Standards state that "science teaching must involve students in inquiry-oriented investigations in which they interact with their teachers and peers…Emphasizing active science learning means shifting emphasis away from teachers presenting information and covering science topics" (National Research Council, 1996, p. 20). The National Council of Teachers of Mathematics (2000) also encouraged teachers to strive for a more student-centered math classroom that deemphasizes rote memorization of isolated skills and facts and emphasizes problem solving and communication to help students "construct" mathematical knowledge.

Research studies have also emphasized that teachers should "shift the present overwhelming emphasis on learning by rote and passive application of learned [facts] to the use of effective critical thinking as the primary tool of learning" (Zoller, Ben-Chaim, & Ron, 2000, p. 572) and students should be encouraged to take an active role in creating understanding & problem solving (Baker et al., 2008; Herman & Knobloch, 2004; Lemlech, 1998; Parr & Edwards, 2004). Doolittle and Camp (1999) emphasized that the traditional methods used in career and technical education of "transmitting to students a discrete and well-establish set of skills and knowledge must be called into question." In a world of rapidly changing technologies, the student must be able to "construct viable knowledge and adapt" (Time for Reconsideration section, para. 2).

Due to this emphasis, teachers then struggle between "the desire to cover a lot of material and the necessity of using more time-consuming methods that allow students to construct meaning from their lessons," stated Jay McTighe, an education consultant and cocreator of the Understand by Design program (Franklin, 2001, p. 2). Teachers often believe it better to expose students to a little bit of everything than to not get to an objective at all. The problem with this method is the material we teach students does not have any meaning to the students and although we "cover" a lot of information, students have trouble retaining it. Constructivism is a method of teaching that emphasizes the importance of building on students' prior knowledge and allowing the student to construct their own understanding.

Constructivism is defined as the philosophy, or belief, that "each individual constructs knowledge rather than receiving it from others" (McBrien & Brandt, 1997). Constructive teaching is based on the idea that students learn best when they can gain knowledge through exploration and active learning. When discussing constructivism, Parr & Edwards (2004) stated "students' learning contexts should be coupled with multiple opportunities in which they 'construct' or make meaning of their learning as it begins, progresses, and escalates" (p. 106). They continued the discussion by stating that these ideas are in agreement with the prevailing philosophy of agricultural education and its focus on rich opportunities in experiential learning in authentic contexts. "Historically, learning in agricultural education has been both 'hands-on' and 'minds-on' in intent, design, and delivery" (Parr & Edwards, 2004, p. 107).

Doolittle and Camp (2003) examined constructivism as theoretical foundation for inquiry-based instruction in agricultural education. They found that there are eight pedagogical principles that were agreed upon by both constructivism and inquiry pedagogy. Here is an overview of those principles: (1) learning is enhanced by the use of authentic or real-world problems, (2) socialization should be included, (3) the problems should be related to student's needs and goals, (4) the problems must lie within a student's past/present experience, (5) students should be assessed formatively, (6) students should be encouraged to become self-regulatory, self-mediated, and self-aware, (7) teachers should act as guide/facilitator, not conveyor of knowledge, and (8) teacher should encourage the student to examine a problem from multiple perspectives.

Additionally, Doolittle and Camp (2003) found that "the underlying philosophical tenets of constructivism support the pedagogical process of inquiry in agricultural education" (p. 70). This is supported by the following shared ideas: (1) emphasis of the active role of the learner in the learning process, (2) learning is an adaptive process designed to make an individual more competent, both cognitively and behaviorally, (3) cognition is designed to make sense of one's experiences, and (4) knowing is both an individual and social process. So, through their discussion, Doolittle and Camp (2003) demonstrated that "constructivism provides sound theoretical support for the use of inquiry and problem-based pedagogy in agricultural education" (p. 70).

Newcomb, McCraken, & Warmbrod (1993) also discuss the importance of inquiry in *Methods of Teaching Agriculture*. One of the Principles of Teaching and Learning is "To maximize learning, students should 'inquire into' rather than 'be instructed in' the subject matter. Problem-oriented approaches to teaching improve learning" (p. 37). In discussion of this principle, they highlight the need for material to be meaningful and understandable so it can be learned and retained. They also highlight the important of students becoming actively involved so that "their behavior—whether thinking, doing, or feeling—is changed" (p.37)

Theoretical Framework

There is a Chinese proverb that says, "Tell me and I forget. Show me and I remember. Involve me and I understand." This is the underlying concept of inquiry-based learning.
Inquiry is a "technique that encourages students to discover or construct information" instead of the teacher "directly reveal[ing] the information" (Huziak-Clark, Van Hook, Nurnberger-Haag, & Ballone-Duran, 2007, p. 311). Inquiry-based learning includes students constructing knowledge and understanding through the teacher's encouragement to explore the world, discover knowledge, reflect, and think critically (Santrock, 2001).

The foundations of inquiry-based learning and the theoretical framework of this study can be traced back to the early 1900s in the writings of John Dewey. The foundational discussion within Dewey's book *The Child and the Curriculum* (1902) was the need for reform from the traditional approach to teaching that focused mainly on the teacher presenting the curriculum without consideration of the needs of the child. He suggests that teachers must:

> …abandon the notion of subject-matter as something fixed and ready-made in itself, outside the child's experience; cease thinking of the child's experience as also something hard and fast, see it as something fluent, embryonic, vital; and we realize that the child and curriculum are simply two limits which define a single process. Just as two points define a straight line, so the present standpoint of child and the facts and truths of studies define instruction (p.16).

Dewey suggests that through this traditional approach, which he refers to as "old education," learning is a process in which concepts are divided into units and units are divided into lessons and lessons are divided into facts. The students are then asked to work through the facts step by step to master each separate part. "The material is not translated into life-terms, but is directly offered as a substitute for, or an external annex to, the child's present life" (p. 31).

Dewey then discusses his ideas of "new education," which parallel constructivism and inquiry-based learning. Dewey suggests that the constructivist approach is more learner-centered and more meaningful to the child because "the child is the starting-point, the center, and the end" (p.13). He continues to further characterize the need for constructivism by stating, "Subject-matter never can be got into the child from without. Learning is active. It involves reaching out of the mind. It is [the child] and not the subject matter which determines both quality and quantity of learning" (p.13).

Benefits of Inquiry-Based Learning.

"We teach a subject not to produce little living libraries on that subject, but rather to get a student to think…for himself, to consider matters,…to take part in the process of knowledge-getting. Knowing is a process, not a product" (Bruner, 1966, p. 72). Inquiry learning is a student-centered approach that allows students to have more control over their process of "knowledge-getting." It arouses students' curiosities and motivates students to continue to seek until they find answers (Slavin, 2006).

Inquiry learning has a variety of benefits for students and teachers. With inquiry learning, students engage in learning by drawing upon their prior knowledge and experiences. It uses the student's prior knowledge "as a building block to integrate new understandings with prior learning" (Lemlech, 1998). Learning has more meaning for students as it becomes a more relevant part of their lives and they begin to better understand the world around them. Ward (2001) praises inquiry learning when he stated that "by building on previously constructed knowledge, students can better grasp the concepts and can move from simply knowing the material to understanding it" (p. 94).

There is a general consensus in the literature regarding the positive impact of constructivist approaches on student dispositions (Burris & Garton, 2007). Herman & Knobloch (2004) found that the constructivist approach generated increases in affective and cognitive outcomes. They reported that students preferred the constructivist approach because they had been actively responsible for their own educational process. The teacher-researcher reflected that "it was exciting to see students building connections, sharing their own experiences with others in the classroom, and working together as a single unit" (p.28).

Consequently, students are motivated by inquiry learning. Not only because students are actively involved in the process but because the expectation of finding the answer motivates the search for it. Constructivism is designed to make the student the center of the learning and the teacher serves as the "guide on the side" instead of the "sage on the stage," which is usually the case with teacher-centered, direct instruction classrooms (White-Clark, DiCarlo, & Gilchriest, 2008). This type of constructivist environment promotes students' curiosity and motivates them to investigate their interests associated with the material, which promotes independent learning.

Inquiry-based learning develops independent problem-solving and critical-thinking skills in students, which is a benefit for both students and teachers. Lemlech (1998) stated that the goal of inquiry learning should be to challenge the student to "engage in activity that requires higher level thinking and reflective processes" (p.136). In addition, this type of learning engages students at their own ability level. Due to the individualistic nature of inquiry learning, all students may not gain the same knowledge, but instead, students are able to discover the knowledge that they need and build upon it.

Inquiry-based learning involves students in explorations, theory building, and experimentation. It encourages active thinking and seeking rather than rote memorization. As stated by Baker et al. (2008), "In our view, encouraging students' problem solving and creative thinking is far better than testing their ability to memorize…The goal [of inquiry learning] is to help students develop skills that enable them to…construct vital…concepts and challenge their ingrained misconceptions" (p. 107). As teachers, we should desire to move our students beyond "regurgitation of facts" to becoming life-long learners who can think independently. One way to do this is through inquiry learning.

Inquiry-based learning also emphasizes students' understanding concepts rather than acquiring skills. It encourages teachers to move away from "the tradition in which knowledge is viewed as discrete, hierarchical, sequential, and fixed" and toward an environment "in which knowledge is viewed as an individual construction created by the learner" (Draper, 2002, p. 521).

Additionally, teachers view the constructivist approach to instruction as beneficial because it has the potential to increase students' achievement. Bredderman (1982) did a synthesis of several studies and found "when results of all the reported studies are averaged, the evidence shows that children in classrooms where [constructivist methods] were used outperform those in comparison classrooms" (p.39). As was discussed before, in this era of *No Child Left Behind*, improving student scores on achievement tests is a focus of school districts and teachers alike.

Drawbacks of Inquiry-Based Learning.

Although there are many benefits to inquiry-based learning, as mentioned above, there are also a few drawbacks to this approach. When teachers are introduced to this method of teaching, many teachers are concerned with the amount of time it takes in preparation and implementation. Baker et al. (2008) discussed that the teachers that they interviewed saw scheduling and time constraints associated with inquiry learning was a serious to moderate problem. Yet, they stated "although initial preparation is time-consuming, their time commitments decrease significantly each year once they have developed lessons" (p. 106). Herman & Knobloch (2004) found there was a larger workload in developing the constructivist units but recommended that "teachers need to consider the payback of their additional time investment when developing and using constructivist units of study."

Ward (2001) also recognized the primary concern of using the constructivist approach is the time required to conceive and design the activities. She then followed this concern with the discussion of the tremendous amount of ideas available on various websites and in publications. She also addressed the classroom management concerns associated with inquiry. She found "the time spent dealing with distractions [associated with inquiry]…was well worth it. This class no longer had difficultly remembering [the material]…The understanding gained from this activity also transferred to [other material]" (p. 95).

Another concern of teachers associated with time is that "in many cases, such as initially learning how to add and subtract, direct instruction can get the job done much more quickly" (Santrock, 2001, p. 375). Other material may also be seen as more quickly taught through direct instruction, but teachers must also consider students' comprehension and understanding of the material. Direct instruction may quickly allow the students to regurgitate a procedure, but not understand the how or why of the procedure that they have imitated, which would decrease the students' ability to retain and reuse the procedure.

The study by Baker et al. (2008) also found teacher and student attitudes were a moderate to slight problem. Teachers must believe in and actively use a method of teaching before students will buy in to it. Baker et al. (2008) found that teachers must feel comfortable with instructional methods and accept them before they will use them consistently. The teacher's attitude directly affects students' attitudes, as does students' interests and feelings of connectedness and relevance of the material.

Herman and Knobloch (2004) reported that teachers should anticipate mixed attitudes from students who have not experienced constructivist activities in previous learning experiences. Constructivist activities can confuse students and teachers due to the dramatic change in roles and students' perceptions of how instructional methods impact their learning. Herman and Knobloch recommended gradually modifying units of study, incorporating pieces of constructivist methods over time, so to create a less drastic change for students. They also found that students who were not accustomed to constructivist instruction "did not know how to handle a new freedom in the classroom" which lead to classroom management issues. However, students quickly adapted—by the second week—to the new situation and became actively engaged.

Although there is agreement on the contribution of constructivist approaches to factors such as knowledge retention, student satisfaction, motivation, and critical thinking, there is much less agreement on its role in knowledge acquisition (Burris & Garton, 2007). Burris and Garton found that students who were taught with the more traditional approach tended to score higher on content knowledge assessments than students taught with constructivist approaches. "While students [taught with constructivist instruction] may have a deeper understanding of the material, that understanding is not represented at the content knowledge level" (Burris & Garton, 2007, p.113). Conversely, Herman and Knobloch (2004) reported that students comprehended more through the constructivist approach as compared to the traditionalist approach.

Other disadvantages to inquiry learning are: students can end up with the wrong solution, use inefficient strategies to discover information, or they never discover what it is they are trying to find out or why (Santrock, 2001). This is why teachers must be facilitators of learning and "guide" students in the right direction. Lemlech (1998) discussed that the teacher's primary roles during inquiry revolves around raising questions that guide the students' investigation. "Questioning [by the teacher] becomes imperative because it is a means to the end" (Ward, 2001, p. 96). In discussions with students, the teacher's questions should act as a springboard for discussions rather than focusing on a "right" answer, which is sometimes the only focus of teachers.

To take it a step further, the research of Sandifer (2005) emphasized the importance of using inquiry-based learning to help students draw conclusions. The study found that constructivist teachers often skipped "concluding sense-making sections" of some activities, which made it difficult for students to draw conclusions about the inquiries that they made. Sandifer also found that teachers had the tendency to reveal in advance the ideas that the students were supposed to construct. If students already know the "answer" they are supposed to find, then inquiry is not present because students are not figuring it out for themselves, so in turn, they are not constructing their own knowledge.

For some teachers, it is difficult for them to be the "guide on the side." They are accustomed to being part of a direct instruction approach in which they were the "sage on the stage." Some teachers feel that they do not have as much control in their classroom if they are not in front lecturing. For inquiry learning to be successful in a classroom, "teachers must first evolve into confident, highly skilled [professionals] who are capable of relinquishing some control in instruction so that students are free to explore their knowledge" (Ward, 2001, p. 96).

Purpose and Objectives

The purpose of this action research study was to identify the impact of using inquiry-based, or constructivist, instruction in a middle school mathematics classroom on student academic achievement. This study was developed to determine which instructional method, constructivism or traditionalism, was more effective in increasing student academic achievement by assessing student growth on in-class assessments. To fulfill this purpose, the following objectives were developed:

1. Describe selected demographics of the participating school and students.
2. Determine student growth within each unit using data from pre-assessment and post-assessment instruments for each unit.
3. Compare the impact of instructional method (constructivism verses traditionalism) with regard to middle school students' academic achievement.

Methods and Procedures

This classroom action research study was conducted by a teacher-researcher to determine the relationship between instructional methods and academic achievement. The context of the study was one class of 18 sixth grade students and one class of 18 seventh grade students at a rural public middle school in southwest Missouri. Prior to this study, students in this school were taught mainly by the traditionalist instructional method, a teacher-centered approach in which teachers modeled how to solve mathematics problems and then would have students practice.

The teacher-researcher used both constructivist and traditionalist instructional methods in the sixth and seventh grade mathematics courses. In the sixth grade course, the teacher taught a unit about operations of fractions using an inquiry-based curriculum, *Connected Mathematics 2,* and the constructivist method, and then taught a unit about basic algebraic operations using a regular mathematics textbook and the traditionalist method. In the seventh grade course, the teacher taught a unit about data and probability using a regular mathematics textbook and the traditionalist method, and then taught a unit about similar figures and ratios using an inquiry-based curriculum, *Connected Mathematics 2,* and the constructivist method.

Pre-assessment and post-assessment instruments were designed by the teacher-researcher and followed the guidelines established by the Missouri Department of Elementary and Secondary Education's Mathematics Grade Level Expectations. The assessment instruments were designed from an accepted and reliable curriculum and as such the instruments were deemed acceptable. To ensure consistency across the assessments, the items were similar in format, types of knowledge assessed, and levels of cognition. Pre-assessments were administered at the beginning of each unit to measure students' prior knowledge. Post-assessments were administered at the end of each unit to measure students' achievement. The difference between the pre-assessments and post-assessments score were used to determine the students' growth during each particular unit. The student growth measured from each unit was compared to determine the methods impact on student academic achievement. Table 1 lists the numbers of points possible for each assessment. Achievement scores were calculated as a percentage of correct items.

Table 1
Points Possible on Pre-assessments and Post-assessments

Assessment	Grade level	Instructional Method	Points Possible
Operations of Fraction Pretest	6	Constructivist	45
Operations of Fraction Posttest	6	Constructivist	50
Basic Algebraic Operations Pretest	6	Traditionalist	55
Basic Algebraic Operations Posttest	6	Traditionalist	55
Similar Figures & Ratios Pretest	7	Constructivist	55
Similar Figures & Ratios Posttest	7	Constructivist	55
Data & Probability Pretest	7	Traditionalist	40
Data & Probability Posttest	7	Traditionalist	40

In terms of threats to internal validity, testing effect could be seen as a weakness. However, this was controlled by large intervals between tests, which make the pretesting effects less threatening (Ary, Jacobs, Razavieh, & Sorensen, 2006). Statistical regression could be seen as another threat to internal validity in this study. To control for this threat, this study did not deal specifically with extreme scores. In terms of threats to external validity, the experimenter effect and novelty effects could be seen as weaknesses. To address experimenter effect, the researcher made an attempt to limit any conscious or unconscious cues to the subjects that would influence their performance. The novelty effect was not a threat because this was the third year that the inquiry-based curriculum had been used.

Descriptive statistics were used to analyze the numerical data for the second and third research objectives. The data was analyzed using PAWS Statistics 17. Class means and standard deviations were calculated for the student assessments. The difference between the pre-assessment and post-assessment score was calculated to determine students' growth within each unit. The means and standard deviations of those growth score were also calculated. A dependent t-test will be run to determine if there was a significant difference between students' growth scores in the constructivist units verses traditionalist units.

Findings

The first objective addressed by this study was to describe selected demographics of the participating school and students. This study took place in a rural southwest Missouri public school. There were 739 students in the district from Kindergarten to 12th grade with 160 students enrolled in the middle school (grades 6-8). About 95 percent of the whole student population is Caucasian, approximately 3 percent Hispanic, and approximately 2 percent Asian. Almost 63 percent of the students receive free and reduced lunch and almost 20 percent of the children in Lawrence County live in poverty.

The participants in this study were sixth and seventh grade students. These students ranged in age from eleven to thirteen years of age. The sixth grade class consists of 18 students- twelve males and six females. Two students in the class are Asian and the rest are Caucasian. The seventh grade class also consists of 18 students- nine males and nine females. All students in this class are Caucasian.

The second objective addressed by this study was to determine student growth within each unit using data from pre-assessment and post-assessment instruments for each unit As displayed in Table 2, the sixth grade mean scores for the inquiry-based assessments were: pre-assessment 10.44% (*SD*=6.15) and post-assessment 71.44% (*SD*=20.50), which equals an average student growth of 60.78%. The sixth grade mean scores for traditional assessments were: pre-assessment 42.39% (*SD*=8.25) and post-assessment 84.89% (*SD*=6.89), which equals an average student growth of 42.5%.

Table 2
Class Means on Assessments & Mean Student Growth for Instructional Methods (*N*=18)

		Pre-assessment		Post-assessment		Student Growth
Grade	Instructional Method	*M*	*SD*	*M*	*SD*	(% difference)
6	Constructivist	10.44	6.15	71.22	20.50	60.78
6	Traditionalist	42.39	8.25	84.89	6.89	42.50
7	Constructivist	14.06	5.02	68.28	16.16	54.22
7	Traditionalist	29.67	10.84	77.56	13.20	47.89

The seventh grade mean scores for the inquiry-based assessments were: pre-assessment 14.06% (*SD*=5.02) and post-assessment 68.28% (*SD*=16.16), which equals an average student growth of 54.22%. The seventh grade mean scores for traditional assessments were: pre-assessment 29.67% (*SD*=10.84) and post-assessment 77.56% (*SD*=13.20), which equals an average student growth of 47.89%.

On thing that could be noted about this data is that the constructivist pre-assessment scores are much lower than the traditionalist pre-assessment scores. This could be due to the fact that the topics that were taught by the constructivist approach were concepts that were more abstract and that students struggled with previously using traditionalist methods thus why the teacher-researcher decided to use the constructivist approach with these topics.

The third objective addressed by this study was to compare the impact of instructional method (constructivism verses traditionalism) with regard to middle school students' academic achievement. When comparing the data from each instructional method, as displayed in Table 3, the mean differences between the students' growth reported for each method should be calculated. Sixth grade students averaged 60.78% growth in the inquiry-based unit compared to 42.5% growth in the traditional unit. So, the mean difference of student growth for the sixth grade students was 18.28%. Seventh grade students averaged 54.22% growth in the inquiry-based unit compared to 47.89% growth in the traditional unit. So, the mean difference of student growth for the seventh grade students was 6.33%.

Table 3
Dependent t-test of Paired Difference of Instructional Methods

		Student Growth		Paired Differences				
Grade	Instructional Method	*M*	*SD*	*M*	*SD*	*t*	*df*	Sig.
6	Constructivist	60.78	19.07	18.28	21.58	3.59	17	0.01*
6	Traditionalist	42.50	8.79					
7	Constructivist	54.22	16.63	6.33	19.80	1.36	17	0.19
7	Traditionalist	47.89	13.00					

* $p < .05$

After running a dependent t-test with the data, as displayed in Table 3, it was found that there was no statistical significant difference (t= 3.59, $p > .05$) in the mean scores of the seventh grade student growth data, but there was a statistical significant difference (t= 1.36, $p < .05$) in the mean scores of the sixth grade student growth data.

Conclusions-Implications-Recommendations

By measuring student growth, using the pre-assessments and post-assessments from each unit, it was evident that the students experienced more growth in the unit taught with constructivist methods as compared to that taught with traditionalist methods. However, only with the sixth grade students' growth scores was there a statistical significant difference ($p < .05$) between the mean scores for the two instructional methods (seventh grade, $p > .05$) when running a dependent t-test. The growth was significantly larger with the sixth grade students than with the seventh grade students. The sixth grade students experienced almost 20% more growth in the inquiry-based unit compared to the traditional unit. This difference could have been impacted by the various types of content taught within the different units. Further research could be done to determine if the type of content effects student academic growth when using a variety of instructional methods.

The results of this study were contradictory to a similar study conducted by Chung (2004). Chung found there were no statistical significant differences between the constructivist and traditionalist instructional methods on three sets of test scores analyzed. One main difference between this study and the one conducted by Chung is the type of mathematics content being taught. Chung's study focused on teaching multiplication, whereas, this study focused on other various topics of mathematics that were not as repetitious in nature. This seems to be in agreement with Santrock (2001) who stated "in many cases, such as initially learning how to add and subtract, direct instruction can get the job done much more quickly" (p. 375).

Burris & Garton (2007) also found results contradictory to this study. They concluded that students taught by traditionalist methods tended to score higher on content knowledge assessments than students taught by constructivist methods. The students taught by the traditionalist method gained an average of nine points from pretest to posttest, whereas, the students taught by the constructivist methods showed an improvement of just over 4 points of their pretest scores. Burris & Garton explained this by stating "more traditional approaches to instruction promoted content coverage…While [constructivist-taught] students may have a deeper understanding of the material, that understanding is not represented at a content knowledge level" (p.113). In contrast, Herman & Knobloch (2004) found that students in their study comprehended more by learning through the constructivist approach as compared to the traditionalist approach but the findings on knowledge retention were mixed. Further investigations should be done to help clarify these concepts.

This study also found that in all units, students on average experienced over 40% growth from the pre-assessment to the post-assessment. Academic growth is important because it demonstrates that learning has taken place. The sixth grade students averaged over 60% growth in the inquiry-based unit, which shows a significant increase in students' understanding of fractional operations. This growth could be due to the nature of inquiry-based learning and the way it encourages students to "discover or construct information" by themselves. In turn, this information is more meaningful to students and they are better able to retain it, which would support the theoretical framework of this study. The constructivist methods used in this study supported Dewey (1902) suggestions for more learner-centered and more meaningful approaches to learning in which "the child is the starting-point, the center, and the end" (p.13). It also corresponded with Dewey's ideas that "[Learning] involves reaching out of the mind" (p.13), which was a goal of the constructivist method used.

This study raises a number of questions needing further investigation for greater generalization. This study should be replicated with different teachers, in different types of school and communities, and with various subjects to determine if type of instruction effects academic achievement. The researcher especially recommends investigations that include the Curriculum for Agricultural Science Education (CASE), which is an inquiry-based curriculum in comparison to traditional methods use in the agricultural science classroom. In any study of methods, student factors such as internal motivation, interest in topics, prior experiences with instructional methods, and personal learning styles should also be considered to fully understand how they influence the students' academic achievement.

This study found that the constructivist approach to instruction yielded increased student academic growth in both the sixth and seventh grade courses, with the sixth grade students' growth scores having a statistical significant difference between the mean scores for the two instructional methods. Future studies should consider using separate groups of students for the different instructional methods. Although limited in generalizability, this study, as stated by Herman & Knobloch (2004), "provides an example that much can be learned when teachers research their practice in action" (p. 31). Even though teachers are prone to teach the way they were taught, which was likely traditionalism, this study shines light on the fact that teachers should consider other instructional methods, such as constructivism, and the impact they could have on their students' understanding and academic achievement.

Studies both within and outside agricultural education have explored this topic and have found varying results. However, the investigation into "best" methods of instruction can be useful to teachers of all subject areas. As all teachers struggle between wanting to cover a lot of curriculum material and the use of more time-consuming constructivist methods, they should consider the possible benefits of teaching methods, such as inquiry, that encourage the students to explore the world, discover knowledge, reflect, and think critically (Santrock, 2001). When teaching, educators should remember the words of Dewey (1902): “Learning is active. It involves reaching out of the mind. It is [the child] and not the subject matter which determines both quality and quantity of learning” (p.13).

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Effects of Think-Aloud Pair Problem Solving on Secondary-Level Students' Performance in Career and Technical Education Courses

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Abstract

A randomized, posttest-only control group experimental design was used to determine the effects of think-aloud pair problem solving (TAPPS) on the troubleshooting performance of 34 secondary-level career and technical education students. There was no significant difference in success rate between TAPPS students and students in the control group (χ^2 (1) = .747, p = .39). However, 38% of students in the control group were successful at troubleshooting their engine, whereas 25% of students in the TAPPS group were successful at the same task. Although there was no significant difference in completion time among students who successfully completed the troubleshooting task (t (9) = -.74, p = .48), the average time to completion for TAPPS students was 4 min longer than that for students in the control group. Considering the lower troubleshooting success rate and increased time to completion, we do not recommend widespread use of TAPPS at the secondary level. This exploratory study does not rule out the possibility that TAPPS could be useful with other secondary-level students. We strongly recommended that future research incorporate a larger sample size and examine variables that moderate the effect of TAPPS.

Introduction

Solely hands-on career and technical education (CTE) is no longer sufficient because performing repetitive technical skills is not an option for employees (Johnson, 1991). Emphasis is now being placed on skills such as creative thinking, problem solving, and decision making (Maclean & Ordonez, 2007). According to the National Research Council (1996) students should be prepared for problems that require systematic thinking to make informed decisions in a global economy.

Technology is being used more than ever in agriculture, from automated production lines in the food processing industry to tractors equipped with automated guidance systems. The intricacies of this technology have increased the difficulties that technicians might face when attempting to repair equipment problems. "Agriculture and science should be the vehicle to learn not only content, but also thinking" (Ulmer & Torres, 2007, p. 114). Current research in agricultural education implies that agricultural educators should put considerable effort into developing and implementing instructional methods that show promise in developing students' higher order thinking (Parr, Edwards, & Leising, 2006). Edwards (2004) reviewed cognitive learning research and concluded that "cognitive learning, including student behaviors involving critical thinking, higher-order thinking skills, and problem-solving, ought to be occurring in secondary agricultural education" (p. 234). This raises a question: How effective are cognitive learning strategies at improving students' technical problem solving?

Theoretical Framework

The theoretical framework for this study is built on troubleshooting as a complex problem-solving activity, metacognition, and think-aloud pair problem solving (TAPPS) as a strategy to invoke self-regulation during problem solving.

Troubleshooting

Holyoak (1995) defined a problem as a situational goal that an individual desires to achieve for which the solution path is not immediately known. All problems consist of three elements: givens, obstacles, and a goal state (Anderson, 1990). Givens are limitations and characteristics that define the initial state of the problem. Obstacles are known or unknown givens that make it difficult to reach the desired solution. The goal state is simply the desired outcome or solution. An individual encounters a problem when an obstacle interferes with achieving a situational goal (Marzano & Kendall, 2007).

Problem solving has been defined as "thinking in relation to some task whose solution is not immediately obvious to the task performer" (Soden, 1994, p. 15). Rubinstein and Firstenberg (1987) stated, "Problem solving requires an integrated use of thinking skills and an appropriate knowledge or data base" (p. 23). Their review of the literature suggests that problem solving requires higher-level knowledge and thinking skills. Davidson, Deuser, and Sternberg (1994) described problem solving as "the active process of trying to transform the initial state of a problem into the desired one" (p. 207-208). Solving problems requires individuals to direct their behavior toward identifying, evaluating, and using possible options that will accomplish the desired situational goal.

Troubleshooting is a unique problem-solving approach for ill-defined problems (MacPherson, 1998). Solutions to these types of problems do not appear rapidly after the problem solver has analyzed the givens and obstacles of the situation (Davidson et al., 1994). Ill-defined problems contain numerous undefined givens and obstacles (Jonassen, 2000) and also may require testing a variety of possible solutions. During troubleshooting, the solution to the problem is not apparent or specific; rather, it is a systematic elimination of possible solutions until the correct solution is attained (Johnson, 1989).

Effective troubleshooting, as described by Johnson (1989), involves a cyclic pattern of hypothesis generation and testing to generate a solution. The problem solver may have only a general awareness that a problem exists (e.g., recognizing that a piece of equipment will not function properly). The problem solver must then define the goal for the situation (e.g., establishing a standard for the equipment to function correctly). The problem solver would then inspect various components of the equipment to identify the obstacle causing the malfunction.

Multiple obstacles could arise during troubleshooting depending on the complexity of the problem. Once obstacles are identified, possible solutions can be identified and evaluated to reach the established standard. Davidson et al. (1994) noted that obstacles could be characteristics of the problem solver. Gitomer (1988) stated that novices lack practice at organizing new information, the ability to sift through strategies to use, and the ability to access knowledge out of context. Poor troubleshooters engage in random repairs without first defining the problem space and determining paths to a solution (Morris & Rouse, 1985). Identification and implementation of an effective strategy is the most difficult skill set for troubleshooters to develop (Johnson 1989).

Individuals often infuse systematic errors into procedures when solving problems (Brown and Burton, 1978). These errors, called "bugs," are a result of faithfully following self-constructed rules from stepwise instruction of procedural knowledge (Marzano & Kendall, 2007). The ability to analyze errors of mental procedures involves actively monitoring and controlling one's thinking. This suggests that awareness of mental procedures would improve troubleshooting success.

Metacognition

Metacognition is the awareness to monitor and control one's thinking. Flavell (1979) stated that metacognitive knowledge "can lead you to select, evaluate, revise, and abandon cognitive tasks, goals, and strategies in light of their relationships with one another and with your own abilities and interests with respect to that enterprise" (p. 908).

According to Davidson et al. (1994), the metacognitive processes that contribute to problem solving involve identifying the problem, defining the problem space, mentally representing the problem, planning how to proceed, and evaluating what is known about the individual's own performance. "Metacognition guides the problem-solving process and improves the efficiency of this goal-oriented behavior" (Davidson et al., p. 207).

Marzano and Kendall (2007) argued that metacognition allows individuals to establish goals in relation to the acquisition of new information. This helps the individual plan procedures to meet established goals and monitor and control their thinking. Metacognition allows a student to recognize that a problem exists, define what is known about the problem, determine the desired outcome of the problem, develop a plan to reach the solution, and determine if the solution works (Davidson et al., 1994).

These mental procedures seem obvious. Yet individuals are often unaware of their own thought processes (Bloom and Broder, 1950). Lochhead (1981) stated that it is a difficult task for an individual to become aware of even fragments of their thinking. Greenfield (1987) found that poor problem solvers tend to lose focus on their solution plan without being aware they had become lost. A lack of attention to reasoning and monitoring tends to lead students to spontaneous and unsound attempts at a solution (Gourgey, 1998). "Good control does not require that one always make the right decisions, but does require that one be able to recover from a false start, to realize that a strategy is not working, and to consider alternatives" (Gourgey, p. 87-88).

Researchers have suggested that curriculum content should be strongly linked with instruction in metacognitive training techniques to improve students' problem solving abilities (National Research Council, 2000; Pintrich, 2002; Schraw, 1998). TAPPS is an instructional technique offered by Whimbey and Lochhead (1986) to improving students' self-regulation during problem solving.

Think-Aloud Pair Problem Solving

The TAPPS strategy involves one student solving a problem while a listener asks questions to prompt the student to verbalize their thoughts and clarify their thinking (Lochhead, 2001). The focus is on having students express their thoughts aloud while engaging in problem-solving activities to externalize the thinking process. While solving a problem, the student verbalizes each action or thought that they engage in to the listener. The listener prompts the problem solver to explain what actions or thoughts are taking place and why. The listener's role is to ensure the solver explains his or her reasoning (Gourgey, 1998) and continues talking by challenging even the shortest silence with statements such as, "Tell me what you are thinking now." The listener also queries the problem solver at any time the problem solver's thinking is unclear to the listener by using statements such as, "Tell me why you did that." Listeners are not allowed to solve the problem or ask questions or make statements that guide the problem solver toward a solution (Lochhead & Whimbey, 1987). The goal of TAPPS is to develop the problem solver's ability to monitor their cognitive and metacognitive progress (Gourgey). The TAPPS strategy may allow students to control or filter possible solutions to the problem during troubleshooting. Heiman and Slomianko (1987) indicated the think-aloud process helps the problem solver avoid skipping steps in reasoning, skipping over important information, or being unaware of getting consumed with a component of the problem. The successfulness of TAPPS may result from problem solvers engaging in self-monitoring, clarifying their thinking, and considering useful solution strategies in order to reach their goals (Bransford, Sherwood, Vye, & Rieser, 1986; Silver, 1987).

Research in CTE has shown that TAPPS significantly improves postsecondary students' problem-solving success (Johnson, & Chung, 1999; Pate, Wardlow, & Johnson, 2004). However, the TAPPS method has not been tested at the secondary level in CTE courses. Will secondary-level students who use TAPPS as a self-regulation strategy improve their troubleshooting performance?

Purpose

The purpose of this exploratory study was to determine if the use of TAPPS improves secondary-level students' success rate and time to completion when troubleshooting small engine faults in CTE courses.

Hypotheses

1. There will be no significant differences in success rate for troubleshooting a small engine compression system fault between students who use TAPPS and students who do not use TAPPS.
2. There will be no significant differences in completion time for troubleshooting a small engine compression system fault between students who use TAPPS and students who do not use TAPPS.

Methodology

Participants
This exploratory study involved five secondary schools in Iowa. Students enrolled in selected CTE courses dealing with small engine technology were purposely selected to be participants in this study. The study population consisted of 34 students enrolled in the selected courses during the fall semester of 2008 and spring semester of 2009. Students' ages ranged from 14 to 17 years.

Research Design
This study used a randomized, posttest-only control group experimental design (Campbell & Stanley, 1968; Figure 1). Students were assigned randomly to two groups. The control group did not think aloud while troubleshooting. The control group was not audio recorded. The researcher observed the control group to ensure students followed protocol. Observations indicated that students did not break protocol. The experimental group used the TAPPS technique while troubleshooting. Audio recordings were used to ensure the fidelity of the experimental treatment.

Students completed the troubleshooting exercise only once and served as subjects in either the control group or the experimental group. The order in which the groups completed the troubleshooting exercise was assigned randomly at the first school site. The completion order was then alternated at each remaining school. To control for the possible threat of diffusion between treatment groups, data from the group that completed the troubleshooting exercise first at each school was used, and data from the second group at each school was removed from the data set. This resulted in four sets of data for the TAPPS group and three sets of data for the control group.

If the control group was selected to go first, the treatment group participated in an unrelated, off-site activity with their classroom teacher. If the treatment group was selected to go first, the control group served as their listening partners. Listening partners were assigned randomly to students in the TAPPS group. Students serving as listening partners were given oral instructions on how to be a listening partner. Students in the control group were told not to help, lead, or assist in solving the problem. Each student serving as a listening partner was given a list of questions to use when probing the troubleshooter. These questions were developed to ensure the listener asked the TAPPS student to vocalize all major steps they took to solve the problem.

		Compression Fault		Compression Fault
R	C	Os, Ot		
R			TA	Os, Ot

Figure 1. Illustration of randomized, posttest-only experimental design. R = random assignment; Os = observation of successfulness; Ot = observation of time to solve the problem; TA = TAPPS group; C = control group.

Procedure

Prior to the experiment, the researcher provided each student with identical instruction regarding domain-specific knowledge on troubleshooting small gas engines via a protocol adapted from Webster (2001). Students received information on the three major systems required for an engine to operate: compression, ignition, and air/fuel intake. Students were instructed to systematically check each system to determine if it was functioning correctly. Examples of possible faults were given for various system malfunction scenarios and the troubleshooting protocol was modified because of malfunctioning ignition testers and a lack of compression gauges. For checking spark in the ignition system, students were instructed to remove the spark plug from the cylinder head while attached to a high tension lead, ground the spark plug threads to the engine block, and crank the engine over using the rewind starter. The researcher explained that if the students observed a blue spark jumping between the electrode gap, the engine's ignition system was functioning properly. To check compression, students were instructed to remove the spark plug from the cylinder head and then pull the rewind starter with their finger over the spark plug hole in the cylinder head. The researcher explained that if the engine had adequate compression, the cylinder pressure would force their finger off the spark plug hole. Students were also told to notice the amount of resistance they experienced when pulling the starter rope because a lack of resistance indicates a lack of compression.

Treatment(s)

Students were assigned randomly to either the experimental or control group. The only difference between groups was the use of TAPPS. Identical small gasoline engines were prepared with an identical fault in their compression system: a missing valve spring retainer. Each troubleshooter was provided a complete set of basic engine repair tools and a 45-minute period in which to identify the correct fault, identify the correct engine system affected, and correctly describe how to repair the fault. No clues were given about the problem, but students were told the problem did not require them to remove the cylinder head or the crankcase cover. Workstations were separated by distance so students could not observer each other's progress. To discourage students from observing each other's progress and discussing the activity between classes, students were told that each engine had a different problem and that each round of troubleshooting had a different problem. The researcher was present during the troubleshooting process to ensure students followed instructions. For safety purposes, students were asked not to repair the fault and run the engine. A task outcome (successful or unsuccessful) was recorded for students on the basis of whether they were able to identify the correct fault, identify the correct engine system affected, and correctly describe how to repair it in order for the engine to operate.

Students in the control group worked alone to troubleshoot their small engine. They received no oral or written instructions regarding TAPPS. Troubleshooting solution(s) were checked to determine successfulness. The researcher recorded successfulness and time to completion for each student.

Students in the experimental group used TAPPS while troubleshooting. They received oral and written instructions on how to think aloud. Each TAPPS student was randomly assigned a listening partner. Listening partners asked questions to prompt the TAPPS students to verbalize their thoughts and clarify their thinking. The TAPPS students were required to orally verbalize their thoughts throughout the troubleshooting exercise. Each TAPPS student was equipped with a digital voice recorder and an attached lapel microphone. During the TAPPS exercise, students' oral verbalizations were recorded with the digital audio recorders to verify that they followed experimental protocol. Following Ericsson and Simon's (1993) protocol for collecting verbal data, the TAPPS students received two practice word problems to allow them to become familiar with the TAPPS procedure. These problems were adapted from Lochhead (2001). The practice task was sufficiently dissimilar so as not to introduce bias into students' reports during the troubleshooting task. Troubleshooting solution(s) were checked to determine successfulness. The researcher recorded successfulness and time to completion for each student.

Analysis

The Chi-square test of association was used to test for differences between the two groups in the nominal dependent variable, task completion for each problem (successful or unsuccessful). An independent *t*-test was used to determine if there were significant differences in completion times between successful students in the experimental and control groups.

Results

Because students were assigned randomly to groups, it was assumed that any preexisting group differences would fall within the range of expected statistical variation and would not confound the results. Table 1 presents descriptive statistics for student performance on the troubleshooting task by group.

Table 1
Student Performance on the Compression Troubleshooting Task by Group

	Task outcome[a]				Minutes to completion[b]	
	Successful		Unsuccessful			
Group	*n*	%	*n*	%	*M*	*SD*
Control (n = 18)	7	38.9	11	61.1	12.7	8.4
TAPPS (n = 16)	4	25.0	12	75.0	16.5	7.8

[a] χ^2 (1) = .747, p = .39. [b] Based on only students with a successful task outcome; t (9) = -.74, p = .48.

Hypothesis 1: There will be no significant difference in success rate for troubleshooting a small engine compression system fault between students who use TAPPS and students who do not use TAPPS.

Seven out of 18 students who worked silently were able to identify the correct fault, identify the correct engine system affected, and correctly describe how to repair it in order for the engine to operate. Four out of 16 students who used TAPPS were able to successfully complete the same tasks. There was no significant difference in success rate between TAPPS students and students in the control group (χ^2 (1) = .747, p = .39). Therefore, hypothesis 1 was retained.

Hypothesis 2: There will be no significant difference in completion time for troubleshooting a small engine compression system fault between students who use TAPPS and students who do not use TAPPS.

Successful students who worked silently had an average completion time of 12.7 min. Successful students who used TAPPS had an average completion time of 16.5 min. Among students who successfully completed the troubleshooting task, there was no significant difference in mean time to completion between groups (t (9) = -.74, p = .48). Levene's test for equality of variances revealed that the assumption of equal variances was met (F (6, 3) = .05; p = .82). Therefore, hypothesis 2 also was retained.

Conclusions/Recommendations/Implications

Even though results from this exploratory study indicate that success rates were not statistically different between the experimental and control group, the secondary-level CTE students who orally verbalized their thoughts while troubleshooting a small gas engines had a lower success rate than students who worked silently. This is in contrast to Pate et al.'s (2004) conclusions that thinking aloud yields higher troubleshooting success rates for postsecondary students. Interestingly, the proportion of successful secondary-level students that worked silently in this study (38.9%) was similar to the proportion of successful postsecondary students who worked silently in Pate et al.'s study (41% and 44%). However, the proportion of successful secondary-level TAPPS students (25%) differs drastically from the proportion of successful postsecondary TAPPS students in Pate et al.'s study (89.9% and 83.3%). Veenman, Van Hout-Wolters, and Afflerbach (2006) argue that elementary levels of metacognitive thought develop during early childhood but become more sophisticated and academically oriented through instructional interventions requiring the explicit utilization of metacogntion. This may mean the impact of TAPPS depends on student maturity and experience. Future research should examine variables that moderate the effect of TAPPS.

There was also a difference in the level of instruction provided to secondary-level students in the present study and postsecondary students in Pate et al.'s (2004) study. All secondary-level students received one class period of troubleshooting instruction. Students were given notes and a demonstration on how to troubleshoot the air/fuel delivery, ignition, and compression systems. Students were told the engine needed all three systems to function correctly, and possible faults for each system were described to the students. Postsecondary students in Pate et al.'s study were enrolled in a junior-level college course that required a prerequisite agricultural technology course in which basic engine principles were taught. Davidson et al. (1994) observed that amount of and quality of a problem solver's domain-specific knowledge can be a limiting factor in their ability to reach a solution. However, secondary-level students' knowledge of basic engine principles and operating theory was not formally assessed prior to this study. Future research should investigate the relationship between secondary-level CTE students' knowledge of basic engine principles and their ability to use TAPPS successfully.

Time to completion was not significantly different for successful secondary-level CTE students who participated in the TAPPS group compared with successful students who worked silently. Even so, average time to completion for the TAPPS students was 4 min longer than for students in the control group. The time required for secondary-level students to overtly verbalize thoughts orally may impede troubleshooting progress, and from an industry perspective, time spent on repairs is an important factor. Considering this potential economic implication together with the lower troubleshooting success rate, we do not recommend widespread use of TAPPS at the secondary level. Although this exploratory study offers no support for using TAPPS at the secondary level, the reader is cautioned against making generalizations from this relatively small sample of 34 students. This study does not rule out the possibility that TAPPS could be useful with other secondary-level students, and we strongly recommended that future research incorporate a larger sample size.

The experimental design allowed the use of only one group from each school. As a result, there was a loss of subjects. A recommendation for further research involving secondary-level students is the use of a clinical approach, such as establishment of a laboratory setting that allows one-on-one interaction between the researcher and student. This procedural change would further increase control over diffusion of information between students and minimize interferences generated by other students. To further limit diffusion between students outside of the experiment, several engine faults could be assigned randomly to students and analyzed as an additional factor.

It is unclear if students who used TAPPS engaged in oral verbalizations that were conducive to successful problem solving. Further research should be conducted to analyze the audio recordings of students' verbalizations to identify and describe key differences between secondary-level CTE students who were and were not successful at the troubleshooting task. Future research could lead to modifications of the TAPPS strategy that may allow secondary-level students to control or filter possible solutions to the problem during troubleshooting. By identifying appropriate metacognitive behavior during problem solving, this research could inform educational practices to assist student development toward expert-like problem solving.

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Impact of FFA Experience on Student Retention and Academic Success

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Abstract

Freshman students with prior FFA experience in the College of Agriculture at the California State University, Chico demonstrated greater retention following their first year of college than their peers without FFA experience. Over 97% of students with FFA experience were retained in the College of Agriculture while only 60% of students without FFA experience at the secondary level returned for their sophomore year. Summated FFA experience revealed secondary agricultural students attended conferences but were least likely to have participated in Agri-Science projects. While there was a statistically significant difference in college retention between students with secondary FFA experience and those who did not participate in FFA activities, summated FFA experience was not a significant predictor of academic success, as measured by GPA.

Introduction and Theoretical Background

According to Gilmore, Goecker, Smith and Smith (2006), the Morrill Act of 1862 established land-grant universities and a 'practical education' in agriculture. These colleges of agriculture have undergone countless changes throughout the years. Many institutions have changed the name of their colleges to be more reflective of the career opportunities available (Gilmore et al.). However, colleges of agriculture and natural resources must continue to help potential students understand the academic and career opportunities in the field of agriculture (Gilmore et al.). With growing concern of public perception and declining enrollments in many colleges of agriculture (Gilmore et al.), student retention appears to be gaining relevance. Additionally, colleges of agriculture and natural resources facing restricted enrollment may need to examine student retention to successful predict students who will reside in the college until graduation.

Factors influencing student retention at four year institutions has been the subject of considerable research (Astin, 1997, 1999; Bean & Metzner, 1985; Tinto, 1975, 1999). Researchers have also investigated the relationships between student enrollment characteristics and student retention within colleges of agriculture (Dyer, Breja, Wittler, 2000; Garton, Ball, Dyer, 2002; Wildman & Torres, 2001). For example, Wildman and Torres found most students indicated prior agriculture experience was the most influential factor when selecting an agricultural major. Esters (2007) found high school GPA and mother's (or female guardian's) level of influence were most likely to predict whether students enrolled in postsecondary agricultural programs. Wildman and Torres concluded recruitment efforts needed to focus on students who have agricultural experiences. Similarly, Dyer et al. concluded colleges of agriculture should recruit students with agricultural experience. However, is secondary agricultural experience, including FFA experience a significant predictor of college retention?

Dyer et al. (2000) suggested college retention could be predicted from student admission criteria. In addition, these researchers concluded that enrollment in secondary agriculture classes and agriculture experience were more accurate predictors of student retention. However, Garton et al. (2002) found the best predictor of academic performance during the first year of college was high school core grade point average. Dyer et al. found students with agricultural experience, "completed high school agriculture courses, were members of the FFA and/or 4-H, and lived in a rural setting are more likely to complete a degree in a college of agriculture than freshmen who have not had those experiences" (p. 498). Surprising, these researchers also found students with higher class ranks were more likely to leave colleges of agriculture than students with agricultural experience and/or high school agricultural coursework.

Prior research suggested student involvement in secondary agriculture courses may influence college retention and graduate rates (Garton et al., 2002; Dyer et al., 2000). Ball, Garton and Dyer (2001) found students involved in agricultural youth organizations had significantly higher GPAs and contributed greater retention rates for second year college students. These findings suggested prior experiences, including secondary agriculture coursework, influence retention and academic performance (Ball, et al., 2001). However, will these findings hold true in programs where secondary agriculture enrollment mandates FFA membership? Will the level of student involvement in FFA programs at the secondary level be related to academic success in a college of agriculture?

Participation in leadership development activities offered by the National FFA Organization has been the subject of considerable research (Ball, et al., 2001; Dormody & Seevers, 1995; Dyer et al., 2000; Garton et al., 2002; Gliem & Gliem, 2000; Talbert & Balschweid, 2004*;* Townsend & Carter, 1983; Wingenbach & Kahler, 1997). FFA participation has also been linked to academic performance and retention (Ball et al.; Dyer et al.; Garton et al.). However, FFA participation has been measured utilizing a variety of methods, including university admission data (Garton et al.; Ball et al.), instruments developed from the FFA manual (Dormody & Seevers) and student perceptions (Talbert & Balschweid*;* Wingenbach & Kahler, 1997). Will self-reported participation in FFA organizations provide a better understanding of the leadership activities completed by secondary students? Will knowledge of these activities provide insight for admissions or recruitment criteria in the College of Agriculture at the California State University, Chico?

The theoretical framework for this study is based primarily upon two college retention models. College retention is framed by Bean's Student Attrition Model (Bean, 1983) and Astin's involvement theory (Astin, 1999). Bean's Student Attrition Model compares student retention to organizational turnover (Bean). The persistence behavior of students can be influenced by behavior intention (Nora, Cabrera, Serra Hagedorn & Pascarella, 1995). External factors have been shown to impact attitudes and persistence decisions (Bean). Astin's involvement theory defines student involvement as "the amount of physical and psychological energy that the student devotes to the academic experience" (p. 518). His theory suggested there are five components to involvement, including the following: physical and psychological energy must be invested; involvement occurs along a continuum; involvement contains both quantitative and qualitative components; student learning and development is directly proportional to student involvement; and the effectiveness of educational policy is directly related to its ability to student involvement. FFA participation may be an external factor which influences student involvement and thus impacts student retention.

Purpose and Objectives

The purpose of this study was to compare the level of secondary FFA involvement of freshmen in theCollege of Agriculture at the California State University, Chico with their academic success during their first year in a college.

The specific objectives of the study included:

1. Identify the demographic characteristics of incoming freshman students within the College of Agriculture (college major and sex).
2. Identify level of participation in secondary agriculture courses, as measured by years of enrollment, held by freshman in the College of Agriculture.
3. Identify level of participation in FFA activities in secondary schools, (offices held, leadership CDE's, leadership conferences, content specific CDE's, proficiency awards, and agri-science involvement).
4. Determine the amount of variance in first year GPA accounted for by summated participation in FFA activities.
5. Determine if difference exist between secondary FFA experience and retention in a college of agriculture, as measured by sophomore year enrollment.
6. Determine if a relationship exists between students' self-perceived level of participation and summated FFA experience.

Methodology

The population of interest in this study included all freshmen undergraduate students enrolled in the college of agriculture during the fall, 2008 semester ($N = 57$). The frame was established from reliable university enrollment records. A census study was completed, thus sampling procedures were not employed. Because this study utilized a census, no attempt should be made to generalize the findings beyond the identified population.

Data were collected using a researcher designed questionnaire which was administered directly to the participants. The questionnaire included demographic questions as well as questions designed to ascertain the level of involvement in agriculture courses and the FFA program. The questionnaire ascertained the level of participation in all leadership and career development events (CDEs) supported by the State FFA. More specifically, participants were asked to share the number of years they were enrolled in secondary agriculture courses, if any, and the following: officer experience; competition in leadership CDEs (creed, prepared speaking, extemporaneous speaking, job interview, parliamentary procedure, best informed greenhand and opening and closing); leadership conference attendance (Greenhand; Made For Excellence; Advanced Leadership Academy; State Leadership Experience; State FFA Conference; and National FFA Conference); content specific CDEs (all CDE's not previously accounted for as leadership CDE's); proficiency awards; and agri-science projects. For each area, participants were asked to indicate numbers of years and level of participation. Level of participation was identified as local or chapter, sectional, regional, state, or national levels. Each specific leadership area was summated to achieve a summated FFA participant score. Summated FFA participation was calculated by weighing the level of participation and years completed for each leadership area. For example, a student completing one year as a chapter officer received a participation score of one while a student who completed one year as a sectional officer received a participant score of two. Thus, participant's leadership experience was summated to account for quantity of activities and level of participation.

The questionnaire was examined for both validity and reliability. A panel of experts reviewed the questionnaire for both face and content validity. A pilot test was given to 30 undergraduate students with similar characteristics of the population to assess the reliability of the instrument. A Cronbach's alpha was conducted and the estimate reliability was .77. Nunnally (1967) suggested that reliability estimates of .50- .60 might be high enough in the early stages of research, thus the instrument was considered reliable for this initial study.

Data were collected directly from the participants during the freshmen orientation course, as all members of the population were required to enroll in this undergraduate course. Fifty-seven of the fifty-seven members of the target population completed usable questionnaires. However, no attempt should be made to generalize the findings of this study beyond the targeted population.

Data were analyzed using SPSS 17.0®. The alpha level was set a priori at .05. Conventions established by Davis (1971) were used to describe the magnitude of correlations where 1.0 is described as perfect, .70-.99 is described as very high, .50 - .69 is substantial, .30-.49 is moderate, .10-.29 is low and .01-.09 is described as negligible.

Results and Findings

Results from this study are limited to the assessed population and should not be generalized to other populations. After initial data collection, data were collected from 57 students, yielding a 100% response rate.

The first research objective sought to identify the characteristics of incoming freshman students within the College of Agriculture, including college major and sex. Demographic data were the collected to address the first research objective (see Table 1). Over seventy percent of college freshman in the College of Agriculture at the California State University, Chico were female (n = 42). Nearly 50% of the participants selected to major in animal science (n = 28) while the smallest percentage of students were enrolled as general agriculture majors (8.80%).

Table 1
Demographic Characteristics of College Freshmen (N = 57)

Demographic Characteristic	*f*	%
Sex		
Female	41	71.90
Male	16	28.10
Major		
Animal Science	28	49.10
Agribusiness	18	31.60
Agricultural Education	6	10.50
General Agriculture	5	8.80

Objective two sought to identify the level of participation in secondary agriculture courses, as measured by years of enrollment, held by freshman in the College of Agriculture (see Table 2). More than 60% of the population indicated enrolment in a least one year of agricultural courses. Over 45% of the participants indicated four years of enrollment in agricultural education courses and FFA while 20 respondents did not participate in secondary agriculture programs. The majority of students with FFA experience were enrolled in agricultural education courses during all four years of high school (*n* = 27). However, slightly over 12% would not be considered program completed as designed by California State FFA standards.

Table 2
Summary of Student Enrollment in Agricultural Education Courses (N = 57)

Agricultural Courses	*f*	%
No enrollment	20	33.30
Enrolled	37	66.70
1 year	2	3.50
2 years	5	8.80
3 years	3	5.30
4 years	27	47.40

Objective three sought to determine the participation in FFA activities, as determined by offices held, leadership CDE's, leadership conferences, content specific CDE's, proficiency awards, and agri-science involvement. Results indicated leadership conferences contributed most to participants' summated FFA experiences, with a mean score of 13.22 (*SD* = 10.85) (See Table 3). Conversely, agri-science participation had the lowest mean score (*M* = .59, *SD* = 1.98).

Table 3
Level of Participation in FFA Activities by Students Enrolled in Agricultural Courses (N = 37)

Participation	*M*	*SD*	Range
Summated FFA Activities	38.16	30.90	0 - 103
Conferences	13.22	10.85	0 - 37
Other CDEs	9.22	11.62	0 - 46
Leadership CDEs	8.76	8.67	0 - 32
Proficiency Awards	4.41	9.06	0 - 50
Officer	1.97	2.70	0 - 12
Agri-science	.59	1.98	0 - 10

Objective four sought to determine the variance in first year academic success within the college of agriculture, as measured by GPA, accounted for by participation in summated FFA activities. An intercorrelation matrix was generated prior to conducting a simultaneous linear regression analysis to evaluate the threat of multicollinearity (see Table 4). The intercorrelation matrix contained the independent variables (sex, and summated FFA participation), and the variable of interest (GPA). Guidelines outlined by Berry and Feldman (1985) were used to address multicollinearity. None of the bivariate correlations between the predictor (independent variable) approached .80, thus no potential threat for multicollinearity was found.

Table 4

Intercorrelational Matrix for First Year Academic Success (N = 57)

Variable	X_1	X_2	Y
Sex[a] (X_1)	1.00	-.13	-.02
FFA Participation (X_2)		1.00	.10
First Year GPA (Y)			1.00

Note. [a]Sex coded: female = 1, male = 2.

Table 5 shows GPA was the dependant variable while sex and summated FFA experience were the independent variables. Approximately one percent of the variance in GPA can be explained by the linear combination of sex and summated FFA experience. However, the model was not significant (F (2, 54) = .29; $p > .05$).

Table 5

Summary of Simultaneous Regression Analysis Predicting First Year Academic Success (N =57)

Variable	β	95% C.I.
Constant	2.72	[2.13, 3.13]
Sex[a]	-.01	[-.42, .40]
Summated FFA Experience	.01	[-.01, .01]
R^2	.01	
F	.29	

Note. N = 57. CI = confidence interval. [a]Sex coded: female = 1, male = 2.

Objective five sought to determine the relationship between secondary FFA experience and retention in the college of agriculture, as measured by sophomore year enrollment. The population of 57 students revealed a significant difference between FFA experience and college retention (see Table 6). Results found only one student (2.50%) with FFA experience did not enroll in their sophomore year in the college of agriculture while eight of the 20 students without FFA experience at the secondary level failed to be retained in the college of agriculture after their freshman year (40%). The Chi squared test of independence yielded a value of 13.59 ($p < .01$).

Table 6

Contingency Table of Retention and FFA Experience (N =57)

	Retained		
	Yes	No	Total
Did Not Participate in FFA	12 (60.00%)	8 (40.00%)	20
Participated in FFA	36 (97.50 %)	1 (2.50%)	37
Total	48 (84.20 %)	9 (15.80%)	57

χ^2(1, N = 57) = 13.58, * $p < .05$.

Determining if a relationship exists between students' self-perceived level of participation and summated FFA experience was the purpose of the sixth research objective. Pearson's product moment correlation was conducted to address this objective (See Table 7). A statistically significant, positive and substantial relationship exists between summated FFA participation and students' self perceived level of participation (*r* = .57).

Table 7
Pearson Product Moment Correlations for Students' Perceived FFA Participation (N = 57)

Variable	X_1	Y
FFA Participation (X_1)	1.00	.57*
First Year GPA (Y)		1.00

p < .05

Conclusions, Implications and Recommendations

Students with secondary FFA experience were more likely to be retained following their freshman year within the College of Agriculture at the California State University, Chico than their peers who did not participate in FFA at the secondary level. This finding supports previous research of Garton et al. (2002), Ball et al. (2001) and Dyer et al. (2000). The consistent findings supporting greater retention of students with FFA experience merits examining admission criteria. The College of Agriculture at the California State University, Chico should encourage and recruit students with FFA experience. With current budget constraints, enrollment decisions may be even more crucial for colleges of agriculture. The College of Agriculture at the California State University, Chico should continue to follow participants in this study to determine if retention following the freshman year is indicative of successful completion of baccalaureate degrees for these students. Will FFA experience allow students to complete a degree in fewer semesters than their peers?

FFA activities and experience vary drastically in this population. However, it is important to consider that incoming students in the College of Agriculture were most likely to participate in FFA conferences. This finding should be used to assess current recruitment practices and support for FFA activities. More specifically, these finding should be shared with all faculty members in the College of Agriculture to increase support for FFA activities offered by the university. The lack of participation in FFA activities such as the Agri-Science fair contest should be evaluated by FFA personnel. Perhaps the College of Agriculture should offer additional support to encourage more students to participate in Agri-Science contests.

Grade point average was not predictive by participation in secondary FFA activities. Students with FFA experience were not statistically different in academic success, as measured by their first year GPA. These findings are similar to Garton et al. (2002) and Dyer et al. (2000). It does not appear accounting for the level of participation in FFA contributed to academic success of first year college students. However, these findings present additional questions which should be the subject of additional research. Would students with FFA experience demonstrate a greater need for social activities during the transition to college and if so, would these activities impact their academic success? Are students with FFA experience more likely to become involved in clubs or student government and if so, could this involvement affect their academic performance? Are students in the College of Agriculture without FFA experience more likely to graduate from secondary programs which do not offer agriculture courses? Would non-FFA students majoring in highly competitive academic programs, such as pre-veterinary studies, have a higher GPA than other non-FFA students? How could secondary agricultural instructors impact the academic preparedness of their students enrolling in colleges of agriculture?

While summated FFA activities varied greatly in this population, a positive, substantial and statistically significant relationship existed between their summated activities and their self-perceived beliefs of FFA involvement. However, this relationship failed to show a strong relationship, which suggests there is some discrepancy between the number of activities in which FFA members participate and their perceived involvement. If involvement contributes to college retention as suggested by Astin (1999), this apparent discrepancy may be of interest for future research. Would students with FFA experience perceive themselves as highly involved in the College of Agriculture? If FFA participation increased, would the level of involvement at the collegiate level also increase and would this impact college retention?

The retention of students in colleges of agriculture needs to be examined with greater importance given the declining enrollments faced by many post secondary agricultural programs. If participation in secondary FFA experiences increases the retention of students following their first year of college, efforts should be made to recruit and enroll students demonstrating FFA experience. Given the increasingly competitive enrollment criteria in the selected College of Agriculture, admissions criteria should be examined to ensure admitted students will be retained by the college. This is especially important for colleges of agriculture facing restricted enrollment in current budgetary climates. While caution should be taken to avoid generalizing to a population beyond this study, the impact of FFA participation should be examined by the state and National FFA organizations. With secondary agricultural programs facing extreme budget restrictions, the need for research demonstrating the value of FFA participation becomes paramount. Finally, additional studies focused on academic preparedness should be encouraged by FFA personnel as well as university faculty to increase the academic performance of post secondary students with prior FFA experience.

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College of Agriculture Academic Advising in a Downturn Economy: Are Adjustments Needed?

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Abstract

Effective academic advising is a component of student retention. With ever increasing pressure from university administrators for academic advisors to improve retention rates of undergraduate students, it is increasingly important that advisors have the necessary tools for success. The purpose of this descriptive study was to assess similarities and differences between two entering college freshmen classes, one from a year of economic stability and one from a year of economic downturn, for factors identified with non-retention. The sample included 207 entering college freshmen from 2007 and 2008. The College Student Inventory was administered during summer orientations. Data related to scholarship recipient status and retention were also gathered. Results indicated there were no statistically significant differences between the two groups based on demographic variables. However there were differences based on academic strengths, scholarship recipient status and attitudinal characteristics related to college attendance. Considering the differences in the U.S. economy for the two years, there was no evidence to support a conclusion that the economy significantly impacted the two entering freshmen classes differently. The researchers recommended research toward a revised model of academic advising incorporating information about student habits, needs, and academic abilities.

Introduction & Theoretical Framework

The National Research Agenda for Agricultural Education and Communications (2007) included a research priority to "improve the success of students enrolled in agricultural and life sciences academic and technical programs" (p. 7). Land grant universities and especially colleges of agriculture have consistently been concerned with recruiting and retention. In a period of economic downturn, state supported schools especially must deal with budget cuts and budget shortfalls. Such financial circumstances may lead to tuition increases as a way to bolster a university's budget needs. However, tuition increases often require approval from state legislatures, which results in a lag in catch-up funding. Crockett (2009) reported a 70 percent increase in federal student loans between 1998 and 2008, while the same period showed a 536% increase in private sector education loans. These budget situations put even more importance on effective recruiting and retention.

The exponential growth of information technology and a continued decline in manufacturing have been instrumental in promoting the belief throughout the United States that a college education is key to future career and economic success (Becker, 1996; Cohen, 1998; Pascarella and Terenzini, 2005). However, as early as 1975, Tinto noted increasing numbers of students who disengaged and/or withdrew from the college education experience due to lack of compatibility between the students' expectations and the institutional environment.

Stern (1970) discovered the ideas and perceptions about college in general and certain schools in particular held by potential college students were not accurate reflections of college life. Stern developed the idea of the *Freshman Myth*, reporting that students tended toward extremely high expectations about all aspects of the college they initially entered and these expectations were significantly more positive than the experiences the same students reported after attending the school. Keup (2007) also examined the *Freshman Myth* concept and concluded that Sterns (1970) findings still held true. However, Keup additionally noted some departures from previous research; "not fulfilling certain expectations may actually enhance adjustment to college in other areas" (p. 27). Other researchers (Aitken, 1982; Pascarella and Terenzini, 1991, Pascarella and Terenzini, 2005) have continued to corroborate the Tinto model.

Many colleges and universities have instituted freshman orientation programs to help incoming students transition to the university experience. These may consist of a 2-3 day session just prior to school starting in the fall or may involve numerous sessions throughout the summer during which students and parents attend various informational and training sessions. Pascarella, Terenzini, and Wolfle (1986) characterized these programs as a form of anticipatory socialization, "a process or set of experiences through which individuals come to anticipate correctly the values, norms and behaviors they will encounter in a new social setting" (p. 156). These formalized socialization efforts should lead to increased commitment and decreased likelihood of non-retention (Pascarella, Terenzini, and Wolfle, 1986). These authors concluded, however, that "orientation had only a small direct influence on persistence, but…had relatively substantial and significant positive effects on both social integration during college… and subsequent commitment to the institution attended" (Pascarella, Terenzini, and Wolfle, 1986, p. 169).

Other researchers (Beal and Noel, 1980; Green and Miller, 1998) reported a relationship between freshmen orientation sessions, improved student grade point averages, re-enrollment and academic program completion. Still others have examined the variables that predicted college retention. Garton, Ball, and Dyer (2002) reported high school core GPA was a predictor of first-year cumulative college GPA, while the other traditional admissions criteria of ACT score and high school class rank were not. Crockett (2009) noted the importance of effective academic advising to college retention, especially in periods of economic downturn, to both maintain enrollment and to connect with students who may have to take time off from school for economic reasons.

Bean (2005) categorized the numerous factors affecting student retention into nine themes: 1) student's background; 2) money and finance; 3) grades and academic performance; 4) social factors; 5) bureaucratic factors; 6) external environment; 7) psychological and attitudinal factors; 8) institutional fit and commitment; and 9) intentions. The Noel-Levitz Retention Management System in place at many universities uses the College Student Inventory (CSI) to "identify dropout-prone students as they walk on campus and put in their path a prevention plan before the student experiences the feelings of being lost, confused, overwhelmed, underprepared and uncertain" (Stratil, n.d., p. 1). The CSI incorporates the nine themes identified by Bean (2005) into three categories: academic motivation, general coping skills, and receptivity to support services.

Stratil identified five objectives for the Retention Management System: 1) Assess students' individual academic and personal needs; 2) Recognize students' specific strengths and coping mechanisms so that successful intervention techniques in areas of need can be implemented; 3) Identify students who are at risk for academic and/or personal difficulties and who may even drop out; 4) Understand students' attitudes and motivational patterns so that intervention is more successful; 5) Enable advisors to have effective and rewarding personal contact with students early in the first term (Stratil, n.d., p. 2). The purveyors of the Retention Management system purport that the system, when used effectively, will increase retention rates especially between the first and second years of college.

The Noel-Levitz Retention Management System has been in place at Montana State University since 2001. The CSI has been administered to all incoming freshmen at each of the four summer orientations at the University. Data have been used to identify students who may be at risk for non-retention and to provide those students necessary resources. The follow-up was accomplished through the Dean of Students' Office (Erika Swanson, personal communication, Nov. 18, 2009). Even though individual students were identified for assistance through use of the CSI data, little had been done to provide insight for academic advisors who work closely with students toward the students' academic goals. One of the identifying areas was money and finance, however there had been no documented effort to identify those students who indicated on the CSI a concern with financing college. Such information could be greatly beneficial to academic advisors in providing not only individual but group advising sessions. Furthermore, there was a need to examine the impacts of national economic conditions on student academic needs, personal and professional needs and student career goals.

Purpose and Objectives

The purpose of this study was to assess similarities and differences between two entering college freshmen classes, one from a year of economic stability and one from a year of economic downturn, for factors identified with non-retention. To accomplish that purpose, the researchers developed and analyzed the following specific objectives.

1. Determine the degree of similarity for selected demographic characteristics between entering college freshman in a college of agriculture for the years 2007 (economic stability) and 2008 (economic downturn).
2. Determine if statistically significant differences existed between 2007 and 2008 entering freshman classes within a college of agriculture at a land grant university based on academic performance.
3. Determine if statistically significant differences existed between the 2007 and 2008 entering freshman classes within a college of agriculture at a land grant university based on self-perceived personal and professional needs of respondents.

Methods and Procedures

Population and Sample

The target population included all incoming freshmen students at Montana State University in 2007 and 2008. The purposive sample for this study was the incoming freshmen students who had declared a major within the college of agriculture (COA) at or before the summer-based freshman orientation sessions (2007 n=94 and 2008 n=113). This research was a part of a larger, ongoing research project to assess student retention and attrition factors at Montana State University.

Instrument

The College Student Inventory (CSI), consisted of Likert-type scale questions ranging from 1-7 (1 being not at all true and 7 being completely true). Noel-Levitz (2001), developer of the CSI, reported the instrument yielded a Cronbach's alpha reliability coefficient of 0.79. All orientation attendees completed the CSI as a mandatory part of the orientation process, thus the response rate was 100%. The researchers obtained the CSI data for the sample from the University Dean of Students' Office. Additionally, through the college of agriculture Dean's Office, the researchers gained access to the fall and spring grade point averages, college of agriculture scholarship recipient status and retention to the fall 2008 and 2009 semester, respectively, for the sample.

Data Analysis

The CSI data were analyzed to determine if statistically significant differences existed between the four orientation groups, the two different years, and orientation sessions one through four between the 2007 and 2008 subgroups. The student academic, scholarship and retention data were similarly analyzed for statistically significant differences. The researchers used chi-square analyses, independent samples t-tests, and one-way ANOVA with a Tukey post hoc test within SPSS V17 to analyze data.

Assumptions and Limitations

The researchers assumed the following for this study:

- All of the students answered the CSI honestly and to the best of their ability.
- Respondents were actually first time students of the new incoming freshman class with a declared major in the college of agriculture.
- Every student had an equal opportunity to apply for a college scholarship during their freshman college year.

The researchers recognized the following limitations for this research:

- This sample was from a single college within a single university.
- According to some economic analysts, the United States recession had already begun in 2007 and had not reached its peak in 2009. However, based on Crockett (2009), the researchers considered the 2007 entering freshman class to have entered college in a time of economic stability and the 2008 entering freshmen class to have entered college in a time of economic downturn.

Findings

Objective 1: Determine the similarity for selected demographic characteristics between entering college freshman in a college of agriculture for the years 2007 and 2008.

Incoming freshmen students reported gender, ethnicity, plans to work during college and the degree sought. The results were summarized in Table 1. There were slight percentage differences for gender and for ethnicity by year. In the plans to work category, over 60% of respondents each year indicated they intended to work between one and 20 hours per week. Interestingly, for each year, approximately two percent reported plans to work between 30 and 40-plus hours per week. Within the highest degree sought category, there were minimal percentage differences between the two years.

Table 1
Demographic data results for the 2007 and 2008 COA incoming freshmen

Variable	2007	2008	χ^2	*p*
Gender			0.020	0.888
Female	53.2%	52.2%		
Male	46.8%	47.8%		
Ethnicity			1.96	0.0743
Black/African-American	0.0%	0.0%		
American Indian or Alaskan Native	1.1%	0.9%		
Asian or Pacific Islander	1.1%	1.8%		
White/Caucasian	95.7%	92.9%		
Hispanic or Latino	0.0%	1.8%		
Prefer not to respond	2.1%	2.7%		
Plans to Work			6.715	0.243
0 hrs/wk	18.1%	24.8%		
1-10 hrs/wk	38.3%	31.0%		
11-20 hrs/wk	35.1%	32.0%		
21-30 hrs/wk	6.4%	9.0%		
31-40 hrs/wk	2.1%	0.0%		
40+ hrs/wk	0.0%	1.8%		
Degree Sought			1.294	0.73
Bachelors	50.0%	47.3%		
Masters	24.5%	23.2%		
Professional	25.5%	29.5%		

* $p<0.05$

Objective 2: Determine if statistically significant differences existed between 2007 and 2008 entering freshman classes within a college of agriculture at a land grant university based on academic performance.

Table 2 highlighted the self reported academic abilities of the 2007 and 2008 college of agriculture entering freshmen. In the year-by-year comparison, a statistically significant difference ($p = 0.029$) was noted for high school grades. The largest difference occurred in the number of students reporting B-C high school grade averages, with the 2008 group reporting 18.6% to the 2007 group's 8.5%. In the general knowledge category, students were asked to respond to the prompt "*compared to the average high school graduating senior in this country, I consider my general academic knowledge to be in the:*" followed by the ranges as shown in Table 2. The responses between years were comparable; no statistically significant differences were returned. Likewise, students responded to the statement, "*in relation to the general population of our society, I consider my academic ability to be:*" followed by the responses shown in Table 2. Once again, the responses between the two subgroups were comparable, with the most notable exception being the average response choice with 21.3% of the 2007 group and 31.9% of the 2008 group. Even so, the chi-square analysis revealed no statistical significance for the category.

Table 2
Self-perceived academic strengths and weaknesses of entering COA freshmen by class year

Variable	2007	2008	χ^2	*p*
High School Grades			12.473	0.029*
A	27.7%	23.0%		
A-B	44.7%	38.1%		
B	16.0%	15.9%		
B-C	8.5%	18.6%		
C	0.0%	4.4%		
C-D	3.2%	0.0%		
General Knowledge			1.356	0.852
80-100%	27.7%	24.1%		
60-80%	36.2%	35.7%		
40-60%	35.1%	37.5%		
20-40%	1.1%	1.8%		
0-20%	0.0%	0.9%		
Academic Ability			6.973	0.223
Extremely High	5.3%	4.4%		
Above Average	71.2%	62.9%		
Average	21.3%	31.9%		
Below Average	2.1%	0.9%		
Considerably Below Average	0.0%	0.0%		

*$p<0.05$

The researchers also collected data from the College of Agriculture Associate Dean to ascertain the numbers of students from the 2007 and 2008 classes, respectively, who had received scholarships during their first year in college (Table 3). At the researcher's particular university, scholarship applications were due on February 1 of each year and scholarships were awarded at a banquet each April. As noted in Table 3, the numbers of students receiving scholarships each year was comparable. However, because the 2008 entering freshmen class was larger (N=113) than the 2007 entering freshman class (N=94), the percentage of scholarship recipients for 2008 was lower. Although the chi-square analysis revealed no statistically significant difference between the totals by year, there was a statistically significant difference ($p = 0.033$) when comparing the June orientations attendees from 2007 and 2008. Curiously, the scholarship recipient status decreased from the first to the last orientation session for the 2007 year, but held fairly steady across all orientation sessions for the 2008 year.

Table 3
Comparison of 2007 and 2008 COA entering freshmen by scholarship recipient status

Variable	2007	*n*	2008	*n*	χ^2	*p*
Scholarship						
June	52.4%	11	23.3%	7	4.564	0.033*
1st July	35.3%	6	23.5%	8	0.788	0.375
2nd July	29.4%	5	16.7%	2	0.624	0.430
August	7.9%	3	18.9%	7	1.972	0.160
Total	26.6%	25	21.2%	24	0.815	0.367

Note. The percentages were based on the number of students attending each orientation session. The total was based on the total number of entering freshmen students in the COA for the year.
* $p<0.05$

Table 4 highlighted the data analysis for the comparison of students retained to the second year, fall semester. While no statistically significant difference existed between the 2007 and 2008 years, trends were noted for both years. For each successive orientation session in 2007, fewer students were retained in the college of agriculture. From three of four 2007 orientation sessions, students had changed to a major outside the college of agriculture by the following fall semester. More alarmingly, in 2008, large percentages of students from each orientation session were no longer attending the university by the fall 2009 semester. For clarification, non-retained students may not have dropped out of school; at <University>, there was no means by which to follow-up and determine if non-retained students had transferred to a different institution.

Table 4
Comparison of 2007 and 2008 COA entering freshmen by retention status

	2007			2008				
Variable	COA	Other	Non	COA	Other	Non	χ^2	*p*
Retention							0.693	0.707
June	81.0%	14.3%	4.8%	60.0%	0.0%	40.0%		
1st July	61.0%	27.8%	11.1%	64.7%	8.8%	26.5%		
2nd July	58.0%	0.0%	41.2%	58.3%	8.3%	33.3%		
August	36.8%	13.2%	50.0%	56.8%	21.6%	21.6%		

Note. COA = College of agriculture; Other = Transferred to other college within University; Non = Non-Retained Students

Objective 3: Determine if statistically significant differences existed between the 2007 and 2008 entering freshman classes within a college of agriculture at a land grant university based on self-perceived personal and professional needs of respondents.

The College Student Inventory instrument contained 90 Likert-type scaled questions to measure a variety of attitudes toward college. A comparison of the 2007 and 2008 entering classes revealed statistically significant differences in three areas; due to space constraints, only those statistically significant items were included in Table 5. The 2008 class, as a whole, reported less concern ($p = 0.036$) over finances than the 2007 class. In contrast, the 2007 entering students indicated a higher need ($p = 0.021$) to find scholarships. For a response related to college being worth the time, money and effort, the 2008 class, as a whole, was less convinced (*p = 0.005*). The 2008 group also reported a higher mean for difficulty in learning new vocabulary (*p = 0.008*). Even though there were statistically significant differences, it was important to note the means in relation to the range of available responses: 1 = not at all true, 7 = completely true. Thus, for the financial problems response, the 2008 combined responses were near the midpoint of the scale and for both the attitude toward university life response and the vocabulary response, both groups were on the *not at all true* side of the scale.

Table 5
Comparison of 2007 and 2008 COA entering freshmen by selected personal and attitudinal characteristics

Variable	2007	2008	*t*	*p*
Financial				
I don't have any financial problems that will interfere with my schoolwork.	3.4787	4.0885	-2.105	0.036*
I would like to talk to someone about getting a scholarship.	5.7128	5.1239	2.320	0.021*
Attitude Towards University or Academic Life				
I often wonder if college education is really worth all the time, money, and effort that I'm being asked to spend on it.	2.5745	3.2920	-2.813	0.005*
Academic				
Learning new vocabulary words is a slow and difficult process for me.	2.5532	3.1416	-2.68	0.008*

Note. scale ratings ranged from 1 = not at all true to 7 = completely true
*p<0.05

To determine whether differences existed among students based on orientation attended, the researchers grouped the 2007 and 2008 entering freshmen classes by the orientation sessions. Table 6 highlighted those variables that returned statistical significance. Overall, the students who attended the first (June) orientation had more positive attitudes about their high school teachers. Specifically, those attending the first orientation session reported significantly more positive responses than attendees at the other three orientation sessions (*p = 0.022; p = 0.021; p = 0.003*) to the statement, "*I liked my teachers, and feel they did a good job*". The June attendees also returned higher responses than both the second July (third session) (*p = 0.028*) and the August (last session) (*p = 0.047*) attendees for the statement, "*The teachers I had in school respected me as a person and treated me fairly*." In contrast, the first orientation attendees returned less positive responses than the third orientations attendees (*p = 0.012*) to the statement, "*Most of the teachers I had in school were opinionated and inflexible*."

Table 6
Comparison of 2007 and 2008 COA orientation groups by selected attitudinal characteristics

Variable	Session Ranked Higher	Session Ranked Lower	Mean Difference	*SD*	*p*
Student Teacher Relationship					
Most of the teachers I had in school were too opinionated and inflexible.	2nd July	June	1.01555	0.3281	0.012*
The teachers I had in school respected me as person and treated me fairly.	June	2nd July	0.87221	0.31114	0.028*
	June	August	0.63451	0.24281	0.047*
I liked my teachers, and I feel they did a good job.	June	1st July	0.78658	0.27271	0.022*
	June	2nd July	0.93644	0.32184	0.021*
	June	August	0.87529	0.25116	0.003*

*p<0.05

Conclusions, Recommendations, and Implications

Based on the research findings, the researchers made the following conclusions and recommendations. Findings for objective 1 revealed no statistically significant differences between the 2007 entering freshmen and the 2008 entering freshman in the college of agriculture at Montana State University. This particular finding was a foundation for the remaining objectives; if the two classes were statistically different in demographic variables, there was no way to assess the degree of similarity or difference for the remaining objectives. The percentage of respondents reporting ethnicity as White/Caucasian was higher than the University's reported White/Caucasian student percentage (84.5%) and the State's reported White/Caucasian population (90.4%). By comparison, the American Indian/Alaskan Native ethnicity reported in this study was lower than what was reported by the University (2.9%) and by the state (7.4%) (Montana State University, 2009 & U.S. Census Bureau, 2009). Thus, the college has diversity challenges that must be addressed. The researchers recommend the college-level administration work closely with university administration, the Native American Studies program, and the State's high schools to develop a strategic and systematic plan for recruiting Native American/Alaskan Native students, the second most populous ethnicity group in the state.

Over 60% of students in the 2007 and the 2008 groups reported they were planning to work 1-20 hours per week while attending school. This information has implications for academic advisors as they advise these incoming students and help them plan fall and spring coursework. At the present, such CSI demographic information is unavailable to academic advisors or staff to help aid students in making wise class choices.

Objective 2 sought to determine differences between 2007 and 2008 entering freshman classes based on academic performance. Significance was found between the orientation groups when they self reported their high school grades. The 2008 group in general reported lower grades than the 2007 group. This fact coupled with the fact that over 60% of the students planned to work 1-20 hours per week has implications for effective advising as well as implications for the university, the college and the departments in assisting students find employment that relates to and extends the students' academic programs.

Due to declining economic conditions, the college of agriculture was not able to provide as many scholarships to 2008 students ($111,000) as to 2007 students ($196,000) (Misti Richardson, personal communication, Dec. 18, 2009). Additionally, there was an enrollment increase in the college of agriculture between 2007 and 2008. Together, these factors may account for the significance found between the 2007 and 2008 groups related to scholarships received. Additional longitudinal research is needed to determine the implications of larger enrollments coupled with fewer scholarships. This is especially important in periods of economic downturn, such as the current condition of the U.S economy.

Of great concern is the large percentage of students who were not retained within the College of agriculture and the University. The general trend of lowered retention rates for each successive summer orientation requires further research and analysis. It is critical for the college of agriculture and university administrators to utilize the College Student Inventory data to develop a proactive means of monitoring student success prior to the student leaving the university either voluntarily or involuntarily, as discussed by Pascarella, Terenzini, and Wolfle (1986). The findings related to retention coupled with the findings related to the scholarship status and the percentage of students who planned to work have implications for a revised model of academic advising whereby faculty and staff have access to additional information about student habits, needs, and academic abilities in order to enhance the effectiveness of advising. Additional research is needed to determine if there is truly a correlation between scholarship received and retention status as was indicated in the finding for the August 2008 orientation, or if there were other variables involved that were not a part of the CSI.

Related to objective 3, the researchers found significant differences between the 2007 and 2008 groups for attitudes toward college. The 2007 incoming freshmen were more concerned with securing financial support for their college education, while the 2008 incoming freshmen reported less concern about financial problems that would interfere with their academics. That finding does not seem to correspond with the finding that over 60% of the students reported plans to work 1-20 hours per week. Considering the differences in the U.S. economy for the two years, there was no evidence to support a conclusion that the economy significantly impacted the two entering freshmen classes differently. Yet again, the implication for an advising model in which the academic advisor has access to the student's CSI results could lead to increased student retention and less student frustration related to the *Freshman Myth* (Stern 1970).

Examination of the College Student Inventory statement regarding respondents' negative thoughts or feelings towards their choice and future as a university student revealed the 2008 incoming freshmen rated the question significantly higher than did the 2007 incoming freshmen. In need of further research was the question as to whether the economy caused students to enroll at the university because there were diminished employment opportunities for high school graduates, as hypothesized by Crockett (2009). The comparison of two years' data was not enough to draw such a conclusion. A similar concern relates to retention of these students at the point adequate employment opportunities do occur, thereby negatively affecting student retention and college growth patterns. Additional research is recommended for these concerns.

The 2008 entering freshman class also reported a higher degree of difficulty with learning new vocabulary. Important to reiterate was the fact that even with significance, both the 2007 and 2008 groups were nearer the *not at all true* end of the scale. Also of note was the fact that not significant between the two groups were questions about math and science ability. Taken by itself, this finding cannot lead to a conclusion. However, in combination with the 2008 group's reporting of lower grades, more negative feelings about attending school, and lower retention, there is adequate evidence to conclude the 2008 group was different enough that additional efforts should be made to ensure these young men and women are able to reach their career goals. The implication is, once again, for a revised advising model, as previously discussed.

The June orientation session attendees reported more positive feelings towards their high school teachers than the other session attendees in both years. There is a need to examine further the students who select the earliest freshmen orientation sessions to determine their impetus for the selection. Combined with the finding that these particular students earned scholarships at higher rates than students in other sessions, there is a need for additional research to determine if this orientation group continues to earn scholarships, whether they become the student organization leaders and power brokers within the college setting and whether there are other long-term advantages to attending the earlier orientation sessions.

The researchers recommend this study be repeated every year at least through economic recovery to gain the necessary longitudinal data that would reveal whether trends exist between economic stability, college enrollment and college retention. Additionally the research should be expanded throughout the U.S. in order to provide the theoretical framework necessary to develop the strategic and systematic advising model that will effectively provide for the needs of students and academic advisors alike. Such research will assist in answering the question, "What teaching, advising, and mentoring strategies most effectively and efficiently yield desired student outcomes with particular groups of students" (The National Research Agenda for Agricultural Education and Communications 2007, p. 7). Faculty members in Departments of Agricultural Education have a unique opportunity to be the leaders in this social science research that is critical to retention efforts in Colleges of Agriculture throughout the United States.

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Controversial Events and News Media Bias: An Examination of Texas A&M University President's Resignation

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Abstract

Objectivity is a key concept in the occupational ideology of journalists (Deuze, 2005). Therefore, it is necessary to study news reporting and bias in conjunction with current events. This study uses a controversial event at Texas A&M University involving the resignation of the University President, Dr. Elsa Murano. This event is unique because the appointment of Murano was controversial and historical; she was the first female, first Hispanic, and youngest president in Texas A&M University's history that was promoted to administration based on her reputation built in agriculture. Sixty-nine news stories written during the three month period surrounding the resignation were analyzed using the Hayakawa-Lowry news bias categories (Lowry, 1985). The 2412 sentences were coded into nine categories: Report attributed, report unattributed, inference labeled, inference unlabeled, judgment attributed favorable, judgment attributed unfavorable, judgment unattributed favorable, judgment unattributed unfavorable, and other. All attributed sources were also catalogued to evaluate bias and fairness. Results reveal a greater number of report attributed sentences and less judgment sentences. However, findings did indicate through the quotations used that bias was not indicated through the report attributed sentences but was for the judgment sentences. The sources that the reporters chose to quote showed bias in both judgments attributed favorable and unfavorable. The results of this study show the importance of objective reporting. Objective reporting is the foundation of public support and journalist credibility.

Introduction

Factual news reporting is a major issue in modern society. Journalist coverage of all topics should be written objectively (Sitton, Terry, Cartmell, & Keys, 2004). No matter what the topic, factual reporting should be of the upmost importance. Although objectivity is defined in different forms, journalists and reporters understand the basic responsibility of presenting facts to the public. People are able to form their own opinion about the topic based on the factual news reports.

With continued technological developments, journalists are expected to cover a broad range of subjects. With controversial topics and a diverse audience, it is important for journalists to keep an unbiased perspective in order to show the real story. Kenny and Simpson (1993) in a study of political news coverage defined bias as "a pattern of constant favoritism" of one candidate over the other, and "bias occurs when one candidate or party receives more news coverage and more favorable coverage over an extended period of time" (Kenney & Simpson, p. 346). According to an article by Rouner, Slater, and Buddenbaum (1999), data suggested that increasing public views of the media being untrustworthy could be damaging to the institution of news reporting. For this reason, a journalist is obligated to report in an unbiased manner.

Objectivity is a key concept in the occupational ideology of journalists (Deuze, 2005). Journalists translate objectivity into their daily work and come up with balance and neutrality of their topic. "Objectivity has been, and still is, accepted as a working credo by most American journalists, students, and teachers of journalism. It has been exalted by leaders of the profession as an essential, if unattainable, ideal" (Brooks, Kennedy, Moen, and Ranly, 1999, as cited in King, Cartmell, & Sitton, 2006, p. 35). Deuze (2005) states that journalists are neutral, objective, fair and (thus) credible.

According to McQuail, (2005) objectivity "has to deal with values as well as with facts and that facts also have evaluative implications" (p. 201). McQuail cites Westerstahl's (Figure 1) objectivity scheme illustrating the components of factuality and impartiality. The truth element is basic facts and accurateness of the topic while relevance requires a selection to take place according to principles important to the receiver. Impartiality contains a 'neutral attitude' that is "achieved through a combination of balance between points of view or versions of events, and neutrality in presentation" (McQuail, 2005, p. 202). The added element of 'informativeness' refers to how the information is sent to the audience, whether it was noticed, understood, or remembered (McQuail).

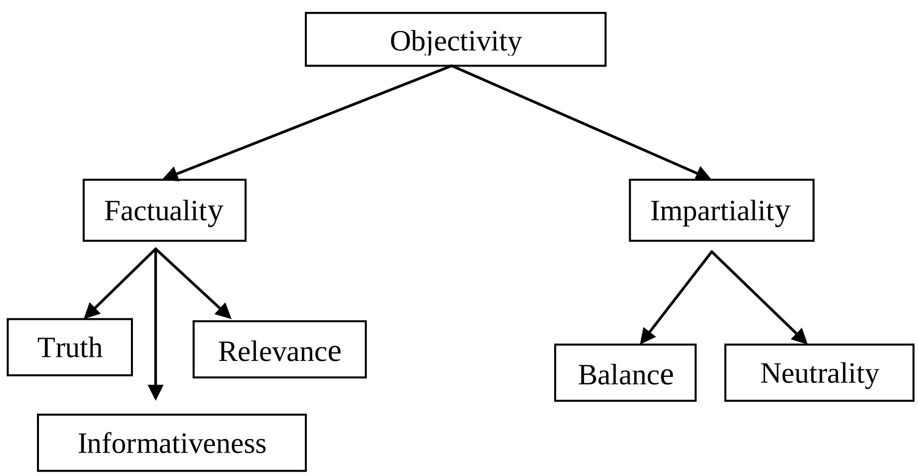

Figure 1. Diagram of the component criteria of objectivity as developed by Westerstahl in 1983.

The main information quality requirements according to McQuail (2005) are

- Mass media should provide a comprehensive supply of relevant news and background information about events in society and the world.
- Information should be objective in the sense of being accurate, honest, sufficiently complete and true to reality, and reliable in the sense of being checkable and separating fact from opinion.
- Information should be balanced and fair (impartial), reporting alternative perspectives and interpretations in a non-sensational, unbiased way, as far as possible (p. 202-203).

The 1947 Commission on Freedom of the Press' aim was "to examine areas and circumstances under which the press of the United States is succeeding or failing; to discover where free expression is or is not limited, whether by government censorship press from readers or advertisers or the unwisdom of its proprietors or the timidity of its management." The social responsibility theory was developed by the U.S. Commission on Freedom of the Press, in response to criticism of the American newspaper press. The report noted that "a responsible press should 'provide a full, truthful, comprehensive and intelligent account of the day's events in a context which gives them meaning'. It should 'serve as a forum for the exchange of comment and criticism; and be a 'common carrier of the public expression'. In addition, it should give a 'representative picture of constituent groups in society' and also present and clarify 'goals and values of society'" (McQuail, 2005, p.171).

The main principles of social responsibility theory are summarized below.

- The media have obligations to society, and media ownership is a public trust.
- News media should be truthful, accurate, fair, objective and relevant.
- The media should be free, but self-regulated.
- The media should follow agreed codes of ethics and professional conduct.
- Under some circumstances, government may need to intervene to safeguard the public interest (McQuail, 2005, p. 172).

The theory of social responsibility portrays the objectiveness that media should go through before presenting information. This objectivity is extremely important when exploring a controversial topic such as resignation. Since the public receives much of its information from the media it is important that they portray an objective stance on the subject matter at hand in order for the public to make their own perception of topic.

Dr. Elsa Murano, the first female, Hispanic woman was appointed to lead Texas A&M University in 2008. A year and a half later, under controversial circumstances, Murano resigned from the presidency. It is important to examine the news coverage of this resignation because Murano has been a vital part of the agricultural industry for more than 20 years. Elsa Murano has been employed at numerous universities and is recognized for her expertise in food safety and microbiology. She was appointed to serve as the Under Secretary of Agriculture for Food Safety for the United States Department of Agriculture. In addition to serving as a professor at Texas A&M University in the Department of Animal Science, she also served as the Vice Chancellor for Agriculture and Life Sciences at Texas A&M University before being appointed to the position of president. Since Elsa Murano has been such an infamous part of the agricultural industry as well as the first Hispanic, woman, and the youngest president of Texas A&M University it is prudent to examine whether or not she was treated objectively in the news media during her controversial resignation.

It is our job as agricultural educators and communicators to inform future journalists and agricultural educators the proper way to communicate unbiased, objective facts to the public. In addition, our job as agricultural educators is to keep the agricultural industry in the best public view possible. Biased, subjective news reporting on issues related to the agriculture industry should be of the upmost importance as agricultural educators. Therefore, it is necessary to examine this issue of biased news reporting so we can further educate the future of our industry to convey the correct message.

A timeline of events will provide context for the study. A national search for a president was conducted and three names were submitted by the search committee to the Board of Regents. On December 7, 2007 Texas A&M University System's Board of Regents named Elsa Murano as sole finalist for the position of president, a finalist that was not vetted by the search committee. By January 3, 2008, the university made history when the first Hispanic, first female, and youngest president took office. A little more than a year later, February 9, 2009, Texas A&M University Chancellor Mike McKinney filed a poor evaluation of the Elsa Murano to the Board of Regents. Elsa Murano sent a response to the evaluation to the Mike McKinney and the Board of Regents on March 10, 2009. On June 14, 2009, one day before meeting with the members of the Board of Regents, the Elsa Murano submitted her resignation, effective on June 15, 2009.

Purpose and Objectives

The purpose of this study was to determine if the news coverage of the controversial resignation of the president of Texas A&M University was biased. Two objectives guided this study:

1. Determine if news stories about the resignation are bias at the sentence level.
2. Examine the source choices to evaluate journalist objectivity.

Methods/Procedures

This descriptive study employed content analysis methodology based on the Hayakawa-Lowry news bias categories (Lowry, 1985). This study will use a single controversial event at Texas A&M University to examine news bias.

S.I. Hayakawa (1940) developed a system to analyze news articles by placing them into one of three categories: (a) report sentences, (b) inference sentences, (c) judgment sentences. Report sentences are considered factual and verifiable. Inference sentences are considered subjective and not immediately verifiable. Judgment sentences express the writer's opinion, most of which are considered by readers to be biased.

Lowry (1985) expanded Hayakawa's previous work by creating nine Hayakawa-Lowry news bias categories (Figure 2). The new categories take into account the concept of attribution.

1. Report Attributed – information is factual and attributed to a source.
2. Report Unattributed – information is factual without citing someone as the source.
3. Inference Labeled – statements about the unknown based on the known. Often interpretations or generalizations of events. Labeled inferences use "tip-off" specific words such as appear, could, may, perhaps, possible, … to let the reader know the information is subjective to some extent.
4. Inference Unlabeled – same characteristics described for category three, only without "tip-off" words. Considered to have more bias because the "tip-off" is not used to "warn" the reader.

5. Judgment Attributed, Favorable – statements of the writer's approval or disapproval for an event, person, object or situation that are attributed to a source and favorable to the subject.
6. Judgment Attributed, Unfavorable – same as category five, only unfavorable to the subject.
7. Judgment Unattributed, Favorable – statements of the writer's approval or disapproval of an event, person, object or situation that are not attributed to a source, but are favorable toward the subject.
8. Judgment Unattributed, Unfavorable – same as category seven, only unfavorable to the subject.
9. Other – all other sentences. Normally includes rhetorical question, and introductory statements.

All sentences in the set of articles were coded by three individuals trained to use the Hayakawa-Lowry news bias categories. The coding sets were compared and discrepancies were noted. The panel reviewed the discrepancies until consensus was reached on the code assignment to each sentence.

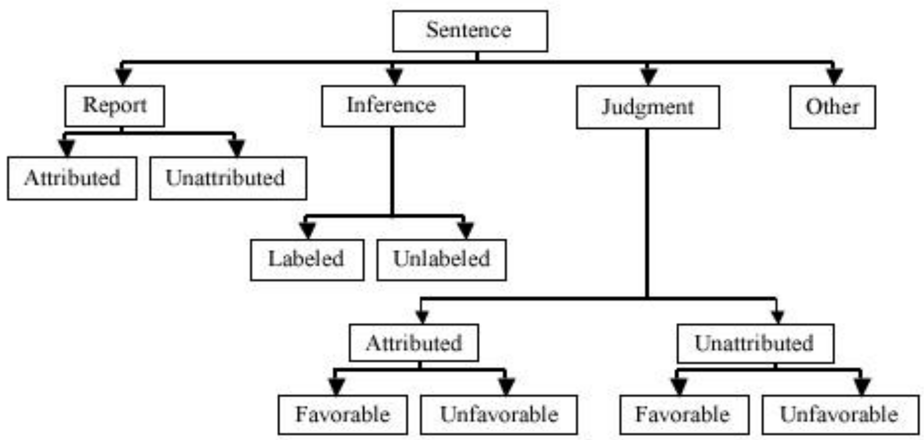

Figure 2. Hayakawa –Lowry News Bias Categories Analysis Model.

To meet the objectives of the study a keyword search of four independent news sources (LexisNexis Academic, Academic Search Complete (Ebsco), Google News search, and the United States Newspaper List) was conducted using a timeframe of June 1, 2009 to September 1, 2009. This time frame was identified based on the sequence of events surrounding the resignation and the usable news stories. The search yielded 162 unique articles, of which 59 were removed because they did not pertain to the resignation topic. An additional 34 articles were removed by the coding panel: Blogs and editorials were removed because of extreme bias and lack of credibility, as well as stories not pertaining to the subject matter. This resulted in a usable sample of 69 articles. Table 1 shows the distribution of identified news stories.

Table 1
Articles by source (N=69)

Source	*n*	%
LexisNexis Academic	25	36.23
Academic Search Complete (Ebsco)	24	34.78
Google News Search	10	14.49
United States Newspaper List	10	14.49

Results/Findings

The keyword search resulted in the identification of 69 unique, usable articles. The majority of articles (95.65%) were published in June 2009. There were only nine publications represented by the 69 articles, all of the publications were regionally based. The bylines of all articles were identified, the Associated Press (AP) produced the largest number of articles (*n*=24), all articles identified as an AP wire story were included in the AP count. There were 17 other journalists identified in the remaining 45 stories. The stories averaged 34.93 sentences with a range of five to 94 sentences. A total of 2,412 sentences (Table 2) were analyzed.

To determine if the news stories were biased the 69 articles were analyzed by three coders using the Hayakawa –Lowry News Bias Categories. Report sentences were the most often identified category (78.07%). Most of these sentences were attributed with 49.30% (*n* = 1189). An example of a report attributed sentence is "“It's too large of a job for one person," said Ray Bowen, who served as A&M president from 1994 to 2002" (Article 1, sentence 5). The majority of judgment unattributed sentences were unfavorable (*n* = 242) toward the resignation of the university president, representing 83.45% of the total judgment sentences unattributed. "In the evaluation, dated February 2009, McKinney ranked Murano as average or below on most of 40 criteria." (Article 1, sentence 13).

The majority of the judgment attributed sentences are unfavorable (*n* = 91), with judgment sentences attributed, favorable representing only 18.75% of the total judgment sentences attributed and 0.87% of the total sentences. An example of a judgment attributed favorable sentence is: "McKinney, a physician and former chief of staff to Gov. Rick Perry, did praise Murano's stewardship of a new scholarship program for students from low-income families, as well as her work on an academic master plan for the campus" (Article 1, sentence 16). An example of a judgment attributed, unfavorable sentence is: "But McKinney's most recent evaluation of Murano shows that the chancellor was sharply critical of her performance during her first year in office" (Article 1, sentence 12).

The majority of the identified inference sentences were unlabeled (*n* = 71) making up 68.93% of all inference sentences. "Murano has said little beyond sending an e-mail to A&M students, faculty and staff in which she acknowledged the importance of fiscal prudence but warned that academic quality is an equal concern" (Article 1, sentence 27). "Other" sentences made up 1.00% of the total number of sentences in this study.

Table 2
Number and percentage of sentences by Hayakawa-Lowry category (N=2412)

Sentence Type	*n*	%
Report	1883	78.07%
Report Attributed	1189	49.30%
Report Unattributed	694	28.77%
Judgment Unattributed	290	12.02%
Judgment Unattributed, Unfavorable	242	10.03%
Judgment Unattributed, Favorable	48	1.99%
Judgment Attributed	112	4.64%
Judgment Attributed, Unfavorable	91	3.77%
Judgment Attributed, Favorable	21	0.87%
Inference	103	4.27%
Inference Unlabeled	71	2.94%
Inference Labeled	32	1.33%
Other	24	1.00%
TOTAL	100.00%[a]	

[a]Total percentage is based on main sentence categories: Report, judgment unattributed, judgment attributed, inference and other.

Data indicated that within this subject, reporters are writing more report sentences attributed to a source (Figure 3). A 20.49% difference in report attributed sentences versus report unattributed sentences existed. Report attributed sentences (n=1189) made up 63.14% of the total number of report sentences and 49.30% of the total sentences. Report unattributed sentences (n=694) made up 36.86% of the total report sentences and 28.77% of the total sentences in this study.

The second objective was to determine if source choices reflected journalist objectivity. The sources identified in the report sentences were categorized based on relationship to the major participants in the controversial resignation: The president, the Chancellor, university faculty, students, and administration at the state level. The largest percentage (19.44%) of the report sentences attributed were from faculty and faculty organization leaders at Texas A&M University. As shown in Table 3, the Chancellor (13.89%), the president (13.22%), and the University administration (13.13%) had the next highest percentage of quoted sources.

Table 3
Percentages of quoted sources for report sentences (*n*=1189)

Source	*n*	%
Faculty/Faculty Senate	231	19.44%
Chancellor Affiliates	165	13.89%
President Affiliates	157	13.22%
University Administration	156	13.13%
Board of Regents	145	12.21%
State Political Representative	102	8.59%
University Affiliate Organizations	89	7.49%
Students	65	5.47%
Other Institutions	38	3.20%
Media	29	2.44%
Other Organizations	11	0.93%
TOTAL		**100.01%**

Table 4 shows that of the judgment attributed, favorable sentences, the Chancellor affiliates had the largest amount of quoted favorable sentences (42.86%).

Table 4
Percentages of quoted sources for judgment attributed, favorable sentences (*n*=21)

Source	*n*	%
Chancellor Affiliates	9	42.86%
Faculty/Faculty Senate	3	14.29%
State Political Representative	3	14.29%
President Affiliates	2	9.52%
University Administration	1	4.76%
Board of Regents	1	4.76%
Students	1	4.76%
University Affiliate Organizations	1	4.76%
TOTAL		**100.00%**

Data showed that the Chancellor affiliates also had the highest amount of quoted unfavorable sentences (46.15%) as shown in Table 5. In addition, the President affiliates had the second highest amount (29.67%) of unfavorable quoted sentences.

Table 5
Percentages of quoted sources for judgment attributed, unfavorable sentences (*n*=91)

Source	*n*	%
Chancellor Affiliates	42	46.15%
President Affiliates	27	29.67%
Board of Regents	9	9.89%
Faculty/Faculty Senate	3	3.30%
Media	3	3.30%
University Affiliate Organizations	3	3.30%
State Political Representative	2	2.20%
University Administration	1	1.10%
Students	1	1.10%
TOTAL		**100.01%**

Conclusions/Recommendations/Implications

The news media has an obligation to the public to provide truthful, factual, and unbiased information, especially in times of controversy. This study utilized content analysis to evaluate news bias regarding a single controversial event at Texas A&M University. The potential for bias was enhanced by the unique circumstances associated with the event: The resignation of the first female, first Hispanic, and youngest president of Texas A&M University.

The majority of sentences were identified as report sentences. Report sentences are the most objective type of sentences identified by the Hayakawa –Lowry News Bias Categories Analysis because they are factual and verifiable. Factuality is one branch of Westerstahl's objectivity scheme (McQuail, 2005). The second branch is impartiality, the presentation of information in a fair and balanced way. The report attributed sentences were relatively balanced between four of the source categories: Faculty/faculty senate, Chancellor affiliates, President affiliates, and Texas A&M University administration. The combination of factuality and impartiality meet the criteria for objectivity by Westerstahl's scheme.

These findings support statements by Deuze (2005) and Brooks et al. (1999) that objectivity is one of the most important factors in journalism. Objectivity is the hallmark of credibility for a journalist. As defined in social responsibility theory (McQuail, 2005) the ability to present "a full, truthful, comprehensive and intelligent account of the day's events in a context which gives them meaning" (McQuail, p. 171) results in a responsible press. Based on this data it can be concluded that the news coverage of the resignation event was unbiased and objective.

However, an indication of bias, or favoritism, for one side of the story was evident in the judgment attributed favorable and unfavorable. The unbalanced use of Chancellor affiliates as sources indicates a favoritism by the media as identified by Kenny and Simpson (1993). It is not known how this favoritism is influenced by access to sources by the journalist. It is important to consider that this demonstration of bias could lead to a lack of trust by the public regarding issues of leadership at Texas A&M University. This finding was unexpected, because Dr. Murano had represented several under-represented groups in University administration it was anticipated that biased statements would reflect these characteristics.

It is recommended that further research be conducted to examine journalist access to sources during a controversial event. Research should also consider a deeper analysis of the content of the news stories to examine the repetition of sources and information versus unique source information. Does repetitive information influence the publics' perception of bias? It would be beneficial to determine if there is a difference between the Hayakawa –Lowry news bias categories analysis and the perception of bias by the reader. In addition, further research should be conducted to examine the media coverage and information sources surrounding other prominent women in agriculture when leaving a high-level position.

Controversy is a staple in the news media. It is important to understand how the media maintains objectivity and what constitutes bias. This information can then be incorporated into communications and journalism education as the next generation of journalists is prepared for the workforce.

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Innovative Idea

Enhancing Career Development Event Preparation Utilizing Jing™ Audio/Video Recordings

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Need For Innovation/Idea

Jing™ is a free, downloadable program available from TechSmith (http://techsmith.com) that allows users to capture a picture or video and narrate what is seen on a computer screen. These short recordings can then be shared over the World Wide Web, through social networking sites or links to recordings can be placed in an email. Recordings can also be saved on a computer and viewed at anytime, without an Internet connection. This new technology has the capacity to engage, captivate, and increase the learning of students involved in FFA Career Development Events (CDE).

The current generation of high school students and FFA members are part of Generation NeXT, which includes students born after 1982. Taylor (2008) stated that these students are "digital natives" and "…technology is a part of most NeXter's identity" (p. 9). With this in mind, the use of Jing™, serves to feed this generations desire to use technology as an integral part of their social and educational lives.

Student participation in FFA Career Development Events (CDE) is an important part of the FFA experience. According to the National FFA Manual (2009), preparing for a CDE is preparing for the future (p.53). Whether an FFA member is presenting livestock judging reasons to a single judge or is reciting the FFA Creed to a room of 500 people, all of the National FFA 24 CDE events require public speaking skills and the process of acquiring these skills can be enhanced with Jing™. Instructor/coach and student preparation for participation is an extensive process that requires teams to dedicate a tremendous amount of time both after school and on the weekends preparing for CDE field days and events. The use of Jing™ can increase and enhance how students prepare and practice for CDE events by expediting the learning process and meeting their technological interests and needs. Besides being free, Jing™ is a very easy program to learn – requiring less than 30 minutes for most students to learn.

How It Works

Jing™ has been used over the past year by the author to engage students involved in judging teams, creed recitation, and extemporaneous public speaking. The instructor/coach for each of these activities created a series of narrations using the free Jing™ program. For livestock judging team members, groups of four photos of various types of livestock were placed into one Power Point™ slide and reasons for placement were recorded. To assist FFA Creed speakers, each paragraph of the creed was written out, again using a PowerPoint™ slide. The instructor then narrated each paragraph and created a screen capture recording. Similar methods were used for other judging teams. Links to all recordings were posted on the instructors' website and all

judging team members and public speakers were provided instructions on accessing the provided links. Links were available to speakers so that they could listen and read at the same time to facilitate memorization of their presentation or enhance delivery methods and general speaking skills.
Extemporaneous and prepared public speakers utilized the Jing™ program in a reverse manner. Speakers either used the instructors' computer or their own computer at home to record either an extemporaneous presentation or their prepared speech. Extemporaneous speakers recorded their presentation over a screen capture of their topic while prepared speakers recorded over a screen capture of a picture that related to their presentation topic. Instructors and student speakers then listened to the recordings together, pausing at moments in the presentation where changes or improvements could be made. These listening/feedback sessions provided not only opportunities for critique but also the opportunity to commend speakers on exceptionally positive moments in their presentation. Recorded presentations were also used when team members or public speakers met as a group to discuss new links or critique individual recordings as a group.

Results To Date/Implications

Students on judging teams and public speakers were eager to investigate Jing™ recordings provided by the instructor to help jump start their preparation. Speakers and team members have been able to learn their speeches and reason delivery methods more effectively and in less time. As a result, less time is spent on delivery techniques and general public speaking skills during after school practice. After school time, typically set aside for learning the basics of delivery and technique, has now been able to be used for actual live practice. More time can now be dedicated to viewing and critiquing classes of livestock because students have been able to learn tone and power of voice while at home or in the school's computer lab. The implementation of Jing™ for FFA Career Development Event preparation has allowed increased practice time without burdening students and instructors.

Future Plans/Advice To Others

Future plans include using the Jing™ program extensively to provide numerous examples and practice narration recordings. Instructors also have plans to use the Jing™ program to record short subject matter lectures to reinforce information delivered in class. Links to recordings will be posted on a separate page of the instructors' website, which is separate and different from team/contest preparation recordings. Based on instructor experience, when utilizing Jing™, recordings should include simple screen captures that relate to the narration. A localized, student accessible website works best for posting recordings for team member and student use. Instructors involved in teaching at the secondary, college, and university level can use the program in ways that are unique and pertinent to their needs. The first-hand experiences shared reveal that there are immense benefits.

Costs/Resources Needed

Jing™ is a free, downloadable application available on the TechSmith website (http://techsmith.com), however, those seeking more capabilities can spend the minimal cost of upgrading to the Jing™ Plus program. The cost of a computer and a microphone would be additional costs to consider. However, school computer labs should be investigated for potential use to reduce departmental costs. The time requirement to learn to use Jing™ is minimal and time to create recordings varies based on the individual.

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Innovative Idea

Enhancing Pre-Service Teaching Advising by Adopting a Skills Inventory

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Introduction

The needs of student teachers have been the subject of considerable research in agricultural education (Edwards & Briers, 2001; Johnson, Lindhardt, & Stewart, 1989; Mundt & Connors, 1999; Talbert, Camp, & Heath-Camp, 1994). Fritz & Miller (2003) found student teachers were most concerned about self-adequacy, including subject matter competency. Similarly, Myers, Dyer, and Washburn (2005) suggested most needs and /or issues facing student teachers include classroom instruction. These findings suggest there may need a need to strengthen subject matter competency of pre-service teachers.

The confluence of university courses that lack skills training and the lack of practical agricultural experience of pre-service students have created teacher candidates that lack many of the fundamental skills they are required to teach. Student teachers commonly express they cannot teach a skill because they do not have adequate skills themselves. Additionally, cooperating teachers have indicated student teachers lack necessary skills.

To identify the scope of this problem, a “skills inventory” instrument was developed to assess the skills of the students in a pre-service program. While students come to pre-service programs with a variety of skills, they will undoubtedly gain additional skills while completing courses in the teacher preparation program. A skills inventory assessment may enhance advising of pre-service students and encourage student to seek courses and experiences that will strengthen their skill set before they begin teaching.

How it Works

The instrument was developed from a variety of sources including consultation with practicing secondary teachers, master teachers, post-secondary agricultural educators, and university teacher educators. The breakdown of courses taught at the secondary level was also used to determine the relative importance of each area. Data generated by state FFA officials indicate the greatest percentage of courses offered is in the areas of agriscience (34 %) and agricultural mechanics (29%). Other courses include plant science, including floral and ornamental horticulture (12%), “other” agriculture (10%), animal science (6%), agricultural business management (4%) and forestry/natural resources (1%).

An initial list of over 250 content specific skills was developed and pared to 172 items representing specific skills necessary to teach and supervise agricultural experiences. The selected skills represented the following areas: Agricultural Business/Information Technology; Agricultural Mechanics; Animal Science; Plant Science/Ornamental Horticulture/Floriculture; and Natural Resources. Emphasis was placed in proportion to the courses taught in the state.

A list of agricultural education majors was extracted from the campus data system, which was deemed to be a reliable source. Students were asked to complete an on-line survey instrument which characterized each skill into a scale of No prior knowledge, I have seen it done, I have done it, and I can teach it. An on-line survey instrument was also used to collect data from subject matter faculty to determine the extent of skills introduced in required subject matter competency courses. Faculty were asked the same items with a modified rating scale: I talk about it; I demonstrate it; My students do it. Students are invited by email to complete the online skills inventory and save their results for advising using the provided print option. Follow ups were made by email and in person by the agricultural faculty to increase the response rate.

Results

The initial survey of 56 students resulted in the completion of 45 instruments (80%). Class level breakdown included: seven freshman, six sophomores, 12 juniors, and 20 seniors. Mean scores were computed for each general area (see Table 1).

Table 1
Mean responses by subject area and class level

	Class Level				
Subject Area	1	2	3	4	All
Agricultural Business/Information Technology	3.0	3.1	3.2	3.3	3.2
Agricultural Mechanics	1.9	2.0	2.6	3.0	2.6
Animal Science	2.8	3.1	3.3	3.3	3.2
Plant Science/Ornamental Horticulture/Floriculture	1.7	2.4	2.8	2.8	2.6
Natural Resources	1.7	2.0	2.0	2.2	2.1
Total	2.2	2.4	2.8	3.0	2.8

Note: Likert Scale (1 = no prior knowledge; 2 = I have seen it; 3 = I have done it; 4 = I can teach it).

It must be noted that these samples are small for statistical analysis and the survey itself does not indicate which courses may have been completed at the time of completing the instrument. Areas of notable weakness were found across class levels in welding, landscape, floral, and natural resources management. Areas of strength for incoming students appear to be in information technology and animal science.

Mandatory advisement is required by the College of Agriculture and the Agricultural Education Department, which provided a venue for individual discussion of the instrument. During advising, the inventory was reviewed and faculty members made recommendations to “fill in the gaps” with directed work and internship courses, other subject matter courses, and summer employment.

Future Plans/Advice to Others

The long term goal of this project is to create a longitudinal study of student skills and to provide students the opportunity to assess their skills as they enter the program, either as freshmen or community college transfers. Students will be asked to complete the assessment as they begin their student teaching experience to evaluate their acquisition of skills while undergraduates. Data should also be used to tailor student teaching assignments to facilitate bridging gaps of necessary skills. Further data should be collected following student teaching to assess gaps in necessary skills prior to completion of student teaching. These data should be used to evaluate course requirements. Ultimately, long term research should provide evidence of increased teacher efficacy through carefully designed curriculum and student teacher placements.

Costs / Resources

The program has no direct cost beyond faculty instrument development and analysis time. The on-line survey is supported by software developed and supported by the College.

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Innovative Idea

Food for Thought Curriculum: An Innovative, Collaborative Agricultural Literacy Project

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Introduction

American agriculture feeds and clothes the world, yet many consumers are unaware of where their food comes from and the impact of agriculture on their daily lives (National Research Council, 1988). The agricultural literacy movement has devoted considerable effort to increase the visibility of agriculture in schools through enhancement of K-12 curriculum. However, many of the efforts have met resistance due to the increased focus on standardization and state testing. The Food for Thought curriculum was designed to address this concern and is aligned with state educational standards.

A pressing issue in American education is the need for increased reading instruction in schools. The National Institute for Literacy states that there are five components of reading; phonemic awareness, phonics, fluency, vocabulary and comprehension (National Institute for Literacy, 2009). Content area reading strategies can enhance reading instruction and enable students to attain a higher degree of literacy (Park & Osborne, 2006). The aim of the Food for Thought curriculum is to promote content area reading in science, social studies, and agricultural sciences.

Innovation

A need exists for an economical, effective and dynamic curriculum. One that is portable, easy to use, and available to everyone. Recently, the [college] along with the Departments of [name] developed an innovative curriculum design and delivery model. The Food for Thought curriculum is intended to be an open, adaptive and collaborative system where teachers in any subject can promote reading, improve agricultural literacy and increase the science, social studies, and language arts skills of all students.

The Food for Thought curriculum is available without cost and is directly linked to individual articles contained in the [state]'s Agricultural Progress magazine. The [state]'s Agricultural Progress magazine is disseminated throughout [state] to over 10,000 subscribers. Through an innovative design, teachers from throughout the state are supplied copies of the publication and then are able to access lesson plans directly linked to each article. The curriculum is a set of 20 individual lessons designed to provide teachers with creative, learner-centered teaching activities to improve fluency, vocabulary, comprehension, and the understanding of agriculture. The lessons are designed to be integrated into existing school-based curriculum and target middle and high school students. The uniqueness of having 20 individual lessons, directly connected to colorful and insightful magazine articles, provides teachers the freedom to integrate relevant and compelling agricultural content into their existing curriculum.

Program Design

The Food for Thought curriculum was designed in conjunction with the Fall 2009 issue of [state]'s Agricultural Progress magazine. Concurrent with the distribution of the magazine, teachers within the state were notified of the available curriculum and sent a link to the Food for Thought curriculum. This initial offering was intended as a pilot project to provide input as to the usability and sustainability of the Food for Thought curriculum. The intent of the creators was to determine future development based on feedback from the initial audiences.

In terms of curricular design, the materials were developed primarily through the dedicated efforts of a student enrolled in agricultural education and a faculty member within the department of [name]. Support for both the technical and graphic aspects of the project was provided through a joint collaboration between the departments of [name] and [name]. Collaboration was a critical element in the creation of this curriculum and constitutes a key aspect of program design.

Results

The special issue of [state]'s Agricultural Progress magazine has been distributed to over 10,000 individuals and several thousand additional copies were allocated for distribution to schools. The online lessons and related articles were also promoted through the Agriculture in the Classroom Foundation. The creators of the curriculum are monitoring dissemination of materials through online click-counts and eliciting feedback from target audiences through e-mail, telephone calls and face-to-face contact. The Food for Thought curriculum has received positive feedback from teachers. Formal data will be collected in order to further develop the curriculum for a wider audience.

Future plans

The creators are optimistic regarding the continued use of the Food for Thought curriculum and the integration of agricultural content within area schools. One of the benefits of this project is the open availability of both the curriculum and an electronic version of the [state] Agricultural Progress magazine. Once the awareness increases, educators external to the state and region will have open access to informative and well-developed agricultural lessons. The continued focus on innovative ways to facilitate open access curriculum and the dissemination of research-based agricultural information provide the keys for continued success of both agricultural education and the land grant system.

Costs

The costs of this project were minimal due to existing infrastructure and active collaboration. The primary expense was the wages of the project development team. The creators estimate that the agricultural education student spent approximately 200 hours with 40 hours of support from the magazine editor. Production of the curriculum in an electronic format eliminated any printing and mailing costs.

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Innovative Idea

Implementing a Collegiate FFA Degree System: Increasing student engagement and ownership in a Collegiate FFA chapter

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Introduction/Need for the Innovation

Post-secondary education provides students with multiple opportunities for success through extracurricular activities and in the classroom. However, students often have difficulty choosing which activities they will devote their time to in order to balance school, work and extracurricular activities. Collegiate FFA (CFFA) members face the same problems of balancing multiple commitments. There is little extrinsic benefit offered for the participation in CFFA that parallels the high school experience (participation in Career Development Events, State Leadership Conferences, etc). The lack of opportunity for recognition can lead to a loss of motivation and enthusiasm towards participating in CFFA activities. The purpose of CFFA is:

> …developing career and leadership skills for future professions, building civic minded leaders, serving our communities, assisting active FFA members in local, state and national levels, to prepare better FFA Advisors, promote scholarship, social experiences, and to serve as a bridge between active FFA membership and the world of a career in the agricultural industry. (National FFA Organization, 2005, p. 2)

Increasing student interest and participation is vital if the organization is to remain functional. Therefore, students must be motivated to become part of a "community" in the same way they were members of their high school FFA chapters. Some form of recognition is essential to building a high level of ownership in the organization; "People engage in activities to maintain their identities and their interpersonal relations within the community" (Woolfolk Hoy & Hoy, 2009, p. 150). Because many of the CFFA members are agricultural education majors, some form of recognition could also assist in the retention and involvement of students in the Department of Agricultural and Extension Education.

To improve the level of participation in the University of Idaho CFFA Chapter, the membership and advisors developed a "Degree System" similar to the system used by the National FFA Organization to encourage and reward participation from members. The National FFA Organization's degree system helps FFA members develop their life skills through a progression of experiences while they are FFA members. The University of Idaho CFFA "Degree System" also seeks to reward student involvement in the organization and develop skills essential for future agriculture teachers.

How it Works

This "Degree System" has three levels of recognition, inspired by the National FFA Organization's Opening Ceremonies, ". . . without labor, neither knowledge nor wisdom can accomplish much" (2009, p. 26). Each degree requires increased involvement from members in the following areas: community service, fundraising, professional development, membership, social/activities involvement, and recruitment. Students complete a written application for each degree detailing their level of involvement. The applications are reviewed by the advisors and officers to ensure that students meet the minimum criteria. Awards are presented to recipients at the annual banquet. A photo is taken of the degree recipients and displayed by the department on the "Degree Wall".

- **Labor Degree** – available to members in their first semester on campus. Students must be dues paying members that attended at least three regularly scheduled meetings. This degree also requires that the applicant participate in at least one activity in each area. Recipients receive a pair of Collegiate FFA work gloves.
- **Knowledge Degree** – available to members in their second year, or those that have received their Labor Degree. Students must be a dues paying member with at least a 2.75 GPA. This degree also requires that the applicant help plan and execute activities rather than simply requiring participation. Recipients receive a FFA business card holder.
- **Wisdom Degree** – available to upperclassmen who currently hold the Knowledge Degree. Students must have been continuous dues paying member since joining with a 3.00 GPA. This degree also requires guidance of committee work, service as a chapter officer or committee chairman, and other participation in the form of planning and implementing activities. Recipients receive an Owl themed, personalized plaque.

Results to Date/Implications

The "Degree System" is a useful tool in motivating the 26 current CFFA members to be active in the organization. The "Degree System" gives members a tangible measure of their success and offers them recognition. Although the "Degree System" is only three years old, and is still improving, 14 members have received the Labor Degree, two have received the Knowledge Degree, and one has received the Wisdom Degree. CFFA has earned the College of Agriculture and Life Sciences' "Club of the Year" twice since the "Degree System" inception.

Future Plans/Advice to Others

For advisors and members wishing to implement their own CFFA "Degree System", we recommend selecting a committee to develop the system; awards, minimum requirements, etc. Once the system is developed by the committee, it should be brought before the membership to be edited and approved. It would be helpful for a beginning CFFA chapter to obtain sponsorship for the awards for the first few years. The key to the "Degree System" is the recognition of members. Students' accomplishments should be publicized by the chapter and the agricultural education department. The CFFA plans to continue with the "Degree System" as it is a valuable tool in the recruitment, retention and motivation of the CFFA members.

Costs/Resources Needed

The main cost of implementing this "Degree System" is for awards. The awards for the Labor and Knowledge Degrees are purchased from the National FFA Gold Catalog. The plaques for the Wisdom Degree are made by the Industrial Technical Education program at the University of Idaho with their laser engraver. The onetime cost for the "Degree Wall" plaques was $85. The annual costs include: $7.50 per pair of FFA work gloves (Labor Degree); $10 per FFA business card holder (Knowledge Degree); and $20 per engraved owl plaque (Wisdom Degree). The indirect costs for the "Degree System" are minimal, mostly involving advisor and student time.

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Innovative Idea

Improving 4-H & Military Partnerships through Operation Military Kids

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Introduction

Today in the United States, youth are facing new challenges of teen pregnancy, drug use, alcohol, and tobacco daily. Youth may be labeled as "at-risk" due to a lack of skills in working with others, understanding self, communicating, making decisions, and leadership (Boyd, Briers, & Herring, 1992). Youth who are not involved in any after school programs are more likely to be at-risk for delinquent behavior, academic failure, and family challenges (Montana 4-H Research Summary, 2003; Benson, 1997). While Curtin, Ingels, Wu, and Heuer (2002) reported that students who are involved in extracurricular activities (defined as an educational activity not falling within the scope of regular curriculum) are more likely to earn a high school diploma.

These challenges can be especially difficult for youth whose parents are involved in the military. In recent years, the increased need for deployment of National Guard and Reserve units has placed new stress on military families. Research suggests that these families do not have the same support network as active duty families living on military bases (Kraft & Lyons, 2009). This situation places these youth at a higher risk for delinquent behaviors if they are not involved in activities within their communities.

4-H programs provide the learning opportunities, relationships, and support to help youth acquire the life skills necessary to meet the challenges of adolescence and adulthood. The 4-H youth development model is based on experiential education opportunities that help youth become competent, caring, confident, connected, and contributing citizens of character (National 4-H Headquarters, 2002). As military families experience the difficulties surrounding lengthy and frequent deployments, 4-H provides predictable programming and a safe, nurturing environment for military youth. This is especially important for youth whose parents are serving in the National Guard and Reserve and live in communities with little or no military presence (Montana 4-H Research Summary, 2003**).** Through grant funding, Operation Military Kids (OMK), in partnership with 4-H, provides programs designed to reduce stress of military youth dealing with the effects of deployment (National 4-H Headquarters, 2002). During the summer of 2009, Lewis & Clark County in Montana received grants to form a military 4-H club partnership, as well as host an OMK day camp, to meet the educational and social needs of military youth.

Program

The OMK program was conducted as a two-day long camp for military youth ages 9-13. Each day, the fifteen youth and teen leaders participated in different workshops delivered by 4-H and military volunteers. Youth were split into small groups and 4-H teen members served as group leaders to help facilitate the learning process. The leader's role was to engage the participants, organize icebreakers and educational games, and help facilitate discussion and journal entries.

Participants were asked to journal the activities they liked, disliked, wanted to further explore or repeat, and what they learned after each workshop. These entries were utilized to plan future workshops, develop potential new clubs, or improve participation in existing clubs.

The program consisted of an archery workshop, a GPS scavenger hunt, military culture activities, 4-H Project Bingo, ice-cream making, and leadership challenge activities. Youth were also able to sample Meals Ready to Eat, or MRE's, and participated in a day long videography and film-making workshop using the OMK Mobile Technology labs. Each team filmed, created, and edited a short video which was viewed by parents and guests at the conclusion of the camp. A final survey evaluation was conducted to assess participants' change in knowledge, skills, and attitudes about 4-H and interest in forming an organized military youth club.

Results and Implications

Research shows that 4-H members are more likely to develop self-confidence, social competence, and practical skills; to take on community leadership roles; and to feel more accepted and listened to by adults (Astroth & Haynes, 2002). The overall goal of the OMK program was to involve military youth in 4-H and ultimately start a club focused on military families. Unfortunately, participation was not high enough to get a new club started, but the five participants who were not already 4-H members enrolled in clubs at the start of the new year.

The evaluation revealed that youth gained a greater understanding of 4-H and the benefits of membership. Parents were also provided with information on what 4-H membership entails and how to become involved. Findings showed that youth increased skills in the areas of filmmaking and archery. Youth also reported that cooperation, social interaction and self confidence were increased as a result of the camp. With growing concerns of youth at-risk in military families, it is important to engage them in productive activities **(4-H Military Partnerships, 2009)**. By targeting this audience, 4-H enrollment has the potential to increase and extend its influence to new, diverse audiences. All county agents should strive to work with their state OMK teams to provide this type of programming to reach military youth and families.

Future Plans

With the success that this OMK program has seen in just the first year, there are plans to continue and expand this particular effort by adding more programs and specific one-day workshops in more complex areas such as Lego robotics and photography. Additional youth development organizations in the community and military events will be utilized for recruitment purposes. The Montana 4-H program also plans to improve marketing and programming efforts to reach military youth and families year-round instead of just during the summer. With the increased visibility and networks created through the program, there is a growing demand for more involvement, partnerships, and 4-H members from this audience.

Costs and Resources Needed

Through the OMK summer camp grant, $250 per day was available for programming activities. There was also an allotment for $3 per day per participant for meals. By utilizing 4-H and military volunteers as presenters and using office resources, costs were significantly reduced. Mobile Technology Labs, associated with the State 4H office, were used for videography workshops and to create camp t-shirts, while existing materials from Challenge Kits, archery, crafts, and military culture were utilized. Meals Ready to Eat, MRE's were brought in by 4-H staff members for the youth to explore.

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Innovative Idea

Improving Teaching Through Community Service Learning

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Introduction/Need for Innovation

Backed by President Barack Obama, the United States government is making a plea to its citizens to volunteer in their communities (Gray, 2009). To advance this initiative, a "United We Serve" website (www.serve.gov) is being created that guides ordinary citizens though the process of how to participate in community service. Schools across the nation are implementing this idea by integrating service learning into courses to improve connections with communities (Hoover & Webster, 2004). Service learning can be used as an instructional method that helps students develop civic and social responsibilities while also provides experiential learning (Anderson, 1998). Educators are using service learning projects more frequently to support educational instruction and build students' career skills (Tucker et al., 1998). These experiential activities help to connect the academic theories taught in classrooms to real world experiences (Zlotkowski, 1998). Montana State University's (MSU) agricultural education students used this idea to not only implement an educational program about agriculture for the youth members at Bozeman's Community Boys and Girls Club in Fall 2009, but to take responsibility and plan it.

How it Works

All students were enrolled in a non-formal teaching methods course. Fifteen percent of the course grade involved the development and implementation of an educational needs-based program for a community organization. Students brainstormed various organizations to collaborate with for the program, and weighed advantages and disadvantages of each, such as age of participants, scheduling, facilities and available resources. A final group decision was made to create a program for Bozeman's Boys and Girls Club. The instructor contacted the Club to determine interest, finalize dates, identify program content, and verify participation. The decision was made to create a hands-on program focused on improving agricultural literacy for youth ages 5-12 years old. The goal of the program was to increase participants' awareness, understanding, and knowledge of food production and processing. Specific objectives were that youth will: (1) Identify and label all food ingredients from each station, (2) Describe the agricultural commodities used in making a pizza, and (3) State the importance of production agriculture to real life.

Agricultural Education students then began developing a four-hour program with class time devoted to its design each week. The title of the program- "Where Does Your Food Come From?" focused on the education of agricultural products on a pizza. Each student was responsible for creating a twenty-minute lesson about a particular pizza ingredient: dough, sauce, cheese, meat, and vegetables. In order to practice various teaching methods, multiple interactive activities were included at each station: (1) *Pizza Dough*: Brainstormed foods made from wheat, ground wheat into flour, made dough, and discussed the process of baking; (2) *Tomato Sauce*: Played a guessing game of foods that originate from tomatoes, identified the ingredients in pizza sauce, hand-crushed tomatoes to create a sauce, and discussed labeling procedures; (3) *Cheese*: Arranged picture cards to identify stages of the cheese making process, colored cow masks, and discussed cheese production; (4) *Meat*: Played a game that identified various meat products and matched them with the corresponding animal and discussed meat processing; and (5) *Vegetables*: Learned about the elements that plants need to grow, categorized various vegetables, planted basil and dill seeds, and demonstrated photosynthesis. Each station concluded with a food product related to the agricultural ingredient for the youth to eat.

As an interest approach, students chose to read an agricultural related book and act out a skit using the different characters. Youth participants were divided into groups using animal name tags that corresponded to each station. Two educational games were planned in the middle of the program to break up the time period. Participants made their own English muffin pizza with an ingredient from each station as an application activity. After lunch, students conducted a final session which included an overview of how each food ingredient related to the food pyramid and life choices. An informal evaluation was conducted by asking youth questions about the information learned. Each participant was allowed to use a puppet to answer questions and extrinsic motivators, such as frisbees, were used to encourage participation in the discussion.

Results to Date/Implications

Sixteen youth participated in the program. The service learning project provided hands-on experiences for both students and youth. The non-formal atmosphere provided an interactive learning environment for students to practice teaching skills, while youth expanded their knowledge of agriculture. MSU's News Service attended a portion of the program and wrote a feature story about the project featured on the university website. The local newspaper also placed the story on the front page of the community news section.

Future Plans/Advice to Others

Due to the news coverage of this program, several organizations have contacted the instructor asking to participate in a similar program. Educators should consider the benefits of service learning projects and strive to connect student learning with community involvement. Service learning projects can have profound effects on students such as improved self-concept, positive attitudes, motivation to learn, and increased community engagement; however, they need to be directly involved in the planning process, feel challenged, have responsibilities, and be given decision making capabilities about the project itself (Morgan & Streb, 2001).

Cost/Resources

The selection of an organization to work with for a service learning project is important in order to have a positive learning experience. This specific program had the resources of the Boys and Girls Club at its disposal. All cooking equipment, tables, crayons, scissors, and other basic supplies were readily available without cost. Students pooled their personal resources to include a wheat grinder, Crockpot, soil, and seeds for the program. Food items and poster boards were the only incurred costs at $90 which were paid through student lab fees. Youth participants paid the regular fee to the Boys and Girls Club for daycare, but did not pay extra for participation in the program. This accessible audience eliminated the costs of marketing and advertisement.

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Innovative Idea

Integrating Teaching With Technology

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Introduction/Need for Innovation

As new technology is being used in the daily lives of college students, campuses must discover new approaches to keep up with the demands of its learners. George (2000) stated, “Technology can play a vital role in helping students meet higher standards and perform at increased levels by promoting alternative, innovative approaches to teaching and learning” (p. 57). Many instructors are adapting instructional delivery to ensure course content fits students’ learning styles. Alston and Warren (2007) specifically stated the importance of using more web-enhanced instruction and technology assignments in agricultural education courses to better prepare future agricultural leaders. A new multimedia resource, the Burns Technology Center Studio 1080 (BTC Studio) at Montana State University allows students to use technologies to build digital exhibits via a collaborative web-based system. This system helps students to develop communication and technology skills by using specialized software to create touch-screen exhibits featuring video, images, text, slide shows and animations (Montana State University, 2009). This resource has been integrated into an agricultural communications course to educate students on how to apply communication skills into a digital storytelling and educational context.

How it Works/Program Phases

The goal of the agricultural communications course was to utilize multimedia technologies to develop an educational capstone project. Students created an online content module using an integration of technologies and presented it using the interactive, touch-screen system. This multimedia collaborative research project was 50% of the course grade. The final exhibit had to effectively educate the audience in a chosen topic area of agriculture.

Throughout the semester, students were required to complete a variety of assignments that developed communication skills and also directly related to their final project. Assignments were focused on developing educational materials, communications skills, and technical competencies to be integrated into the exhibit. Project assignments included: (1) Write a detailed proposal of your research project, (2) Create a storyboard for a multimedia exhibit, (3) Conduct an informative interview with professionals/experts on your research topic, (4) Create a photo portfolio for use in the exhibit, (5) Shoot and edit videos to create an inclusive two-minute video to be used in the exhibit, (5) Develop a comprehensive 24-screen educational, research-based exhibit using the web-based BTC Studio software, and (6) Present your BTC Studio exhibit to the class and public.

Each student group created a digital exhibit based on primary and secondary research conducted during the semester. The module also had to include at least two of the following components: a map, graphics, music/audio clip, an interactive quiz, or a slideshow of pictures. Course content focused on developing students’ basic competencies in the areas of public relations, technical writing, research skills, video production, photography, storyboarding, scriptwriting, and graphic design. Assignments encouraged students to utilize various communication methods and techniques to build the exhibit.

Results/Implications

The goal of the course was not only to engage students in learning a variety of technical skills, but also to provide them with the opportunity to use rich media technologies to showcase capstone projects. Development of a research-based agricultural exhibit required students to conduct research, design educational content, utilize multimedia software, integrate technologies, and build digital exhibits. Use of this integrated teaching approach inspired students to apply digital media, research, and agricultural communication skills, both written and oral, in a new way. The capstone project was graded on the professional quality of each media asset produced, as well as on the overall presentation and how well the module communicated and publicized the agricultural information. Peers, the instructor, and BTC Studio directors evaluated the final module. As a result, students learned how to integrate technologies to showcase communications work. Students also gained networking contacts in the agricultural field and a better understanding of careers in agricultural communications from the research conducted.

Students in two agricultural communications courses have created ten exhibits for the BTC Studio. Example topics include, “Beef Production-Pasture to Plate”, “Noxious Weeds of Montana”, “A Course about Horses”, “An Overview of Extension”, and “The History of Agriculture in Montana”. A post-evaluation questionnaire revealed positive feedback. Students reported that they learned to work with new software programs such as Photoshop, iMovie, iPhoto, Google Picasa, PowerPoint, a scrapbook program, Microsoft Paint, Microsoft Works, Windows Movie Maker, and Audacity. Specific communication and technology skills learned included photo editing, interviewing, video production, audio recording, design principles, graphics creation, summarizing and organizing information, storyboarding, file conversions, and creative ways to communicate information.

Future Plans/Advice to Others

The agricultural communication class intends to continue this project with the BTC Studio. Other courses and universities alike should strive to incorporate unique and innovative multimedia technologies in order to meet student needs. The U.S. Department of Education (2009) reported an increasing amount of evidence related to the beneficial opportunities of using technology to improve education. Educators can easily integrate photography, videography, and audio recording into standard writing assignments, giving students a more technologically creative approach to course work. Instruction can be done in formal or non-formal educational settings, which can reach out to community members and be used as a communication link between schools and communities. A common software program, such as PowerPoint, could become interactive by adding a video clip with audio from Windows Movie Maker, challenging students to integrate technologies in a new way and create modern presentations.

Costs/Resources

The Agricultural Education program was privileged to have an innovative multimedia system to utilize as part of a course. The equipment used in the course was digital cameras, video cameras, and audio recorders provided by the students and the department. The BTC Studio was created through grant funding, and there are other grants and resources available to help purchase equipment to assist with innovative projects. Universities and departments may even have equipment available for check out. There are also several low-to-no cost software programs to develop multimedia activities to supplement coursework. General access to computers and digital equipment with the right software can add a multimedia component to any course.

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Innovative Idea

Making Learning Meaningful for the Millennials: Podcasting with a Purpose in Agricultural Education

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Introduction and Background

Change is inevitable. Not only in our personal lives do we experience change, but our Nation and local communities are constantly undergoing revision for the common good. Requiring stronger accountability in our Nations' schools was initiated with the No Child Left Behind (NCLB) legislation of 2001. NCLB increased qualification requirements for teachers as well as criteria for measuring program effectiveness (Reeves, 2003). On the eve of his election President-elect Barack Obama challenged the Nation when he stated that, "Today we begin in earnest the work of making sure that the world we leave our children is just a little bit better than the one we inhabit today" (Phillips, 2008).

As we face the challenges that come with a new generation of learners, we must reconsider pedagogy and identify practices and tools that are relevant for today's millennial generation (McAlister, 2009). Technological advances foreign to previous generations of learners are commonplace among today's "computer savvy" generation. An increased use of social networking sites (2009) such as Facebook and Twitter coupled with the millennials' ready acceptance of MP3 technology found in Apple's IPOD is evidence of this generation's preference for electronic communications. Consistent and intensive use of this technology has essentially "hardwired" the millennial's brains differently as a result of this technology (Taylor, 2006). So, it is important that teachers embrace technologies used commonly by millennial students to educate them more effectively (Williams, 2008).

In a study by Murphy and Terry Jr. (1998), it was concluded that electronic technologies would improve the way we teach agricultural education, allowing for increased communication between students as well as students and teachers. Additionally, it was concluded by Murphrey, Miller, and Roberts (2009b) that, technologies popularized by millennials, such as the IPOD, are capable of increasing student learning. Understanding that "teachers often teach as they are taught" (Murphrey, Miller, & Roberts, 2009a, p. 98), it is essential that pre-service teachers of agricultural education be exposed to these new technologies as instructional tools to add to their "teaching toolbox."

How It Works

In the course AGED 4113, Laboratory Instruction in Agricultural Education, pre-service teachers were introduced to the concept of audio podcasting, using free audacity software and iPod/MP3 technologies. The introduction of this technology was to encourage pre-service teachers to incorporate these technologies in lessons, as well as their preparation of students for Career Development Events (CDE) and other FFA activities. Students were provided a detailed demonstration and training, which included general usage of the iPod/MP3 and the free audacity software. Thereafter, student teachers were charged with developing an audio podcast of the FFA Creed for CDE preparation to use during their field-based student teaching experience. The student teachers were also encouraged to continue to develop other podcasts during their 12-week student teaching experience.

Results to Date

To date, 27 pre-service teachers received instruction on the podcasting technologies, found Internet examples of audio podcasts and created their own audio podcast of the FFA Creed for use in CDE preparation during student teaching. The reactions of pre-service teachers regarding the podcasting were positive. Pre-service teachers also identified several areas of benefit regarding podcasting technology. These areas included

- Lessons for use by the instructor
- Lessons for instructional use during an instructor's absence
- Preparation of CDE teams
- Preparing students for public speaking events
- Local SAE tours to expose students to a variety of SAEs

Future Plans and Cost/Resources Needed

AGED faculty at [***] will continue to prepare pre-service teachers for the remainder of the Spring 2010 student teaching semester. AGED faculty will also incorporate the use of video podcasting into the already existing audio podcasting activities to enhance pre-service teachers' understanding and use of podcasting generally. In the future, a focus group interview will be conducted during the student teachers' capstone seminar debriefing session. This will enable faculty to examine and discuss student teachers' use of podcasting as a learning tool with their secondary students. The focus group interview will inform faculty about students' perceived needs regarding their effective uses of podcasting and what may be opportunities for systematic inquiry on podcasting as an instructional tool. In addition, it is anticipated that cooperating teachers' use of podcasting will be studied in the future, together with the impact of student teachers on cooperators' adoption and use of this innovative instructional delivery method, i.e., student teacher as "change agent" (Rogers, 2003).

Item	Cost Range	Average Cost
iPod or MP3	$59-$300	$179.50
PC or Mac	$750-$2,500	$1,625
Audacity Software	Free	Free
Total	**$809-$2,800**	**$1,804.50**

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Innovative Idea

Produce Your Own: A Community Gardening Program

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Introduction/Need for Innovation

Interest in at-home vegetable gardening continues to grow at a rapid pace. The National Garden Association conducted a survey in 2008 with results showing that "43 million U.S. households planned to grow their own fruits, vegetables, berries, and herbs in 2009—that is up 19% from 36 million households in 2008" (National Gardening Association, 2009, p.4). Families concerned with healthier eating, along with the economic downturn, have been compelled to replace lawns with vegetable gardens. While some people have a natural green thumb, others need direction and education in order to reap the fruits of their labor.

Montana Outdoor Science School (MOSS) was originally founded in 1994 as a summer camp for youth. The goal was to create fun, hands-on, nature-based educational experiences. After 14 years, MOSS has grown into a year- round program offered in both local schools and outside of school settings. While youth remain the primary focus, MOSS has found the growing need to teach adults. Based on an informal needs assessment, gardening was identified as a top priority for adult programming.

Many County Extension offices offer an adult Master Gardener Program which includes advanced gardening training, short courses, newsletters, and conferences. The program focuses on building participants' gardening knowledge and skills to contribute to community growth and development (Schrock, Meyer, Ascher, & Snyder, 2000). However, with the comprehensive training provided in this program comes a large time commitment of 17-22 weeknight sessions (Young, 2007). Therefore, the "Produce Your Own" program was created to introduce adult participants to gardening in a similar manner, but with shorter, less demanding sessions.

How it Works

Gardening is a time-honored tradition that can be difficult to master in a place where winter is the dominant season. Produce Your Own was created to give a foundational introduction into the challenges of vegetable gardening in southwest Montana. Scheduled in accordance with the growing season, this educational program consisted of a series of four interactive sessions focused on plot design, crop selection, garden maintenance, harvesting and preserving. Each workshop included guest speakers considered experts in their field and hands-on learning activities. Classes were held in the summer of 2009, approximately one month apart on four Saturdays from 9:00 am -12:00 pm. Specific program objectives were that participants will: (1) learn to plant and grow the ten "best" vegetable crops suited for the region (2) prepare a garden plot with seeds or seedlings from the local nursery, (3) demonstrate correct maintenance procedures for a home garden (4) increase consumption of locally or home grown produce over the next year, and (5) increase knowledge and skills in harvesting, cooking, and preserving vegetables.

The program consisted of three workshops and a farm tour. Workshops were developed to provide experiential learning opportunities that allowed participants and instructors to interact, discuss, and demonstrate gardening procedures. A brief description of each workshop and its activities are as follows: The *Planning and Planting Your Garden* session introduced the course, explained how to prepare a garden bed, included a lecture by a Plant Science Professor about seed selection and planting dates, and concluded with participants planting vegetable seeds and creating a plot design map; the *Natural Weed and Pest Control* session included a discussion by the Master Gardener State Program Coordinator and the owner of a local gardening store focused on USDA labeling regulations, integrated pest management techniques, organic and natural weed control, and the basics of composting; and the *Harvesting and Preserving Your Crops* workshop incorporated a demonstration with a local Chef, handouts with how to preserve or cook vegetables grown in <state>, and concluded with a hands-on cooking class made with participants' garden vegetables. The culminating *Local Farm Tour* brought concepts full circle as participants visited with local growers about production scale farming, garden design, greenhouse management, U-pick operations, cooperative farm business practices, and marketing and distribution techniques. Participants were also able to sample vegetables and take transplants home for their personal gardens.

Discussions were used at the beginning of each session to assess the knowledge and interest of participants. Participants were asked what they would like to learn from the sessions and what they already knew about gardening. At the end of each session, informal evaluations were conducted to measure learning and prepare content for future workshops.

Results to Date/Implications

A total of twenty-eight adults participated in program; however, a decrease in participation was seen after each workshop. There can be many explanations for this drop in participation, but the dates and times of the classes was the most common finding. Because Montana has a short summer and growing season, participants indicated that they were less willing to participate in weekend programs. Informal evaluations also revealed that the majority of participants felt the registration cost was a fair price and would recommend the class to others.

Future Plans/Advice to Others

This program can be adapted in many ways for adults, seniors, youth, and other audiences interested in home gardening. As revealed, the dates and times when a program is offered can have a large impact on the participation. Offering the program during weeknights might help to increase participation for working adult audiences. In addition, because the sessions were spread throughout the summer months, many participants forgot about them, even though reminder emails were sent. Only one press release was used to promote the program. More frequent advertising would have likely increased participation in later sessions. Additionally, one-time panel discussions on a specific gardening topic could be designed to reach a broader, more diverse audience. Twiss (2003) concluded that the benefits of gardening "enhance nutrition and physical activity and promote the role of public heath in improving quality of life." (p. 1435). Expanding the program's audience and location to senior living homes, coffee shops, group homes, after-school programs, and community gardening sites could greatly increase the number of people introduced to the benefits of home gardening.

Cost/Resources

Cost was set at $10 per class or $30 if participants pre-paid for all four sessions. All materials for the hands-on portions of the class were donated by local businesses. Materials and resources used included soil, seeds, 4-packs, demonstration tools, handouts, and vegetables. In addition, every class had a raffle for a gardening related prize which were all donated by local businesses. Prizes included vegetable transplants, gardening tools, gloves, seeds, and a composter as a grand prize.

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Innovative Idea

SPSS Syntax for Calculating Mean Weighted Discrepancy Scores

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Introduction

The Borich Needs Assessment Model (model) has been used extensively in agricultural education to determine the in-service or training needs of secondary agriculture teachers and Extension faculty. Developed by Borich in 1980, the utility of the model has been demonstrated in numerous needs assessment studies related to agricultural education, both in formal settings (Edwards & Briers, 1999; Garton & Chung, 1997; Layfield & Dobbins, 2002; Newman & Johnson, 1994; Peake, Duncan, & Ricketts, 2007) and nonformal settings (Bowe, Smith, Massey, & Hansen, 1999; Conklin, Hook, Kelbaugh, & Nieto, 2002; Gregg & Irani, 2004; Waters & Haskell, 1989). The model allows ratings of two dimensions of training or other institutional need to be taken into account simultaneously to determine where discrepancies exist. Borich recognized that his model allows for modification and expansion; however, he primarily described two types of discrepancy scores: importance/ability and what is/what should be.

Need for Innovation

To use the model, mean weighted discrepancy scores (MWDS) must be calculated for each item. Each of the previously noted articles indicated the formula used to calculate MWDS; however, none of the articles suggested a specific medium to calculate the MWDS (e.g., statistical software, spreadsheets, manual calculation, etc.) much less provide an automated algorithm for doing so. Neither SPSS nor Microsoft Excel has a dedicated menu function or graphical user interface (GUI) for calculating MWDS. Some Excel applications have been developed to automate calculation of MWDS to some extent, but they still require manual entry of data and/or cutting and pasting of data; both of which are subject to user error and, thus, miscalculation of MWDS. Furthermore, the process is again subject to user error when the MWDS are incorporated back into SPSS or other software to complete the model. A Google search of the Web also failed to yield a feasible solution to calculating MWDS for multiple variables. A more automated process within statistical software (SPSS in this case) was desirable primarily to make the process of calculating MWDS more efficient, but also reduce opportunities for user error.

Prior to 1992, syntax files, or text files containing commands in the SPSS command language, were the only way to use SPSS. Today, most SPSS commands are accessible from the menus and dialog boxes in the GUI, but the ability to write syntax files remains very useful. Some SPSS commands are available only through the command language and the sequential ordering of commands can be scripted through syntax files to automate repeated data analyses. SPSS syntax files can be saved, allowing you to replicate exactly your analysis at a later date. For many applications, SPSS syntax also provides for greater flexibility and increased productivity when compared to the menu system (Boslaugh, 2005). However, many SPSS users do not have syntax writing or editing experience (Boslaugh). Therefore, SPSS syntax was written to simplify the process of calculating MWDS and expedite the needs assessment process.

How it Works

To determine where discrepancies exist for importance/ability, a discrepancy score is determined by taking the importance rating minus the ability rating for each respondent for each competency. A weighted discrepancy score is then calculated by multiplying each discrepancy score by the associated mean importance rating. The MWDS is produced by taking the sum of the weighted discrepancy scores for each competency and dividing it by the number of respondents. To determine where discrepancies exist for what is/what should be, a discrepancy score is determined by taking the desired level (*what should be*) minus the perceived level (*what is*) for each respondent for each competency. A weighted discrepancy score is then calculated by multiplying each discrepancy score by the associated mean desired level (*what should be*) rating of the competency. Lastly, a MWDS is calculated by taking the sum of the weighted discrepancy scores for each competency and dividing it by the number of respondents.

Step-by-step instructions are included in each syntax file; however, the following steps summarize the step-by-step instructions provided in each syntax file:

1. Start SPSS and open the discrepancy score calculator (syntax) for the discrepancy score needed.
2. Open the raw dataset.
3. Edit the “USER REQUIRED” items in the syntax. Two “USER OPTIONAL” items—missing values and filter subset—are included in the syntax, but do not require editing unless the user deviates from the SPSS default settings.
4. Click on the line above "DATASET NAME." From the top menu, click on Run and select To End. A new data file will open with variables named mwds1, mwds2, etc. Those values are the mean weighted discrepancy scores.

Implications

Editing the syntax files is a simple process. The SPSS syntax can be edited within SPSS or copied and pasted into any text editor to modify the variable lists by using the “Find and Replace” command. Using the SPSS syntax provides greater automation of MWDS calculations and eliminates making manual calculations or copying data from SPSS to Microsoft Excel. Also, syntax serves to document how results were produced.

Future Plans

Future plans include adding a point and click interface for including relevant variables, eliminating the need to edit syntax, and expanding the MWDS calculator to accommodate a comparison of groups’ or organizations’ needs by calculating a MANOVA to create a single dependent variable forming a linear composite or a single weighted variable from all of the competencies (G. Borich, personal communication, April 30, 2009). The single weighted variable could be used to test the difference between the weighted means to identify the common needs between groups; potentially allowing one in-service or professional development training to address the greatest training needs common to both groups. Comparing groups, such as county Extension agents from different regions or secondary agriculture teachers from different regions, allows for autonomy between regions to address unique needs, while identifying common needs across regions to offer the most widely needed trainings at venues such as state level conferences.

Costs / Resources Needed

The command language comes as a standard part of the base SPSS product. The SPSS syntax for calculating MWDS is free of charge. Most syntax will run on any installation of SPSS; whereas, the menu system may vary across versions or operating systems (Boslaugh, 2005).

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Innovative Idea

Using Technology to Improve the Teaching of Equine Science: Bringing the Horse Clinician into the Classroom Virtually

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Introduction

When you think of the typical classroom setting, what do you see? Perhaps you picture a classroom, with desks, chalkboards, students, and a teacher. Or, maybe you picture a more high-tech setting where the learner is separated from the teacher by distance and time (Dooley, Lindner, & Dooley, 2005) and accesses his/her work using a computer and the web. Whatever the picture in your mind, it is quite possible that it does not include a horse and saddle.

Equine science is an area that generates high interest from agricultural science students; however, agricultural science teachers are not always prepared to provide the specialized instruction required in these courses. Horse clinicians are individuals that are skilled in the area of horse training, and providing detailed hands-on instruction in this area. However, not everyone has access to horse clinician, or if they do, they may not be able to afford to bring them into the classroom. One potential way to address this problem is through the use of technology. Improved technologies, as well as the introduction of television channels like "RFD-TV" (Rural Media Group), have provided clinicians a new venue to share their talents. Clinicians are now able to market their knowledge to self-directed learners who wish to gain knowledge from expert clinicians without leaving home or the traditional classroom. This poster shares an example of how agricultural science programs can benefit through the involvement of horse clinicians in the delivery of their educational programs.

Websites have become widely accepted as a successful approach to disseminating information, and specifically equine related material (Denniston & Callahan, 2005). Society has become dependent upon educational material that can be accessed quickly and easily. Research indicates people are increasingly using the web as a means of gathering information, and this is a proven means of distributing information to people interested in equine science (Denniston & Callahan, 2005). Cavinder, Antilley, Gibbs, and Briers (2008) proved the effectiveness of delivering educational materials on teaching horse judging through a website. In this study, positive responses were received from participants when they were asked if the information presented increased their ability to teach conformation (83.3%), balance (91.6%), structure (82.6%), and quality (92.0%). Participants also reported that the information presented increased their understanding of oral reasons (92.3% positive responses).

Methodology

The success of this effort will depend on quality instructional designers working with knowledgeable clinicians to develop effective online materials. There are two primary objectives for this project. The first objective is to develop an improved lesson structure for clinicians to utilize. This objective capitalizes on borrowing strategies from the field of education and incorporating them into this segment of the equine industry. The second objective is to create more valuable horse training video resources for the public and to improve the knowledge base within the field of equine science. To formulate effective lessons, equine clinicians should integrate the following steps into their videos:

1. State the instructional goals and learner objectives for the lesson
2. Provide an overview of the lesson
3. Present key vocabulary, anatomy and equipment that will be necessary for learner comprehension
4. Demonstration and discussion of the skill(s)
5. Review
6. Provide an assignment or application activity
7. Provide feedback on assignment or application activity

The creation of instructional media as described can provide agricultural science teachers with the tools needed to provide quality equine science instruction as part of their educational programs. Finally, evaluation of students' reactions and feedback will need to be performed to improve the development and delivery of materials to increase effectiveness.

Implications

Employing instructional design techniques to the knowledge of horse clinicians should result in improved instruction in the agricultural science classroom. Implications include the increased ability of students to transfer knowledge and skills gained from the lessons to useful, real-world applications, an increase in knowledge transfer leading to better understanding within the field of equine science and in the equine industry, and an increased interest in equine science. In addition, students will be able to make connections with working horse clinicians through these technology-enhanced lessons.

Future Plans/Advice to Others

Technology is constantly changing. Clinicians and teachers dedicated to providing quality lessons will need to continually update technology and adapt curriculum as needed. New technologies should only be utilized if these technologies increase learning effectiveness. It is important to look for opportunities to help students make connections, and to seek opportunities to bring "reality" into the classroom. Clinicians should be aware that the knowledge they impart through their clinics and lessons contribute to the field of equine science. This awareness should bring with it a sense of responsibility to create the best materials possible in order to ensure the continued growth and improvement of the field of equine science and the equine industry.

Resources needed

Cooperation and support from schools and/or decision makers is essential. A thorough understanding of the essential knowledge and skills students are expected to gain from the learning materials is crucial. Interested and willing experts that include horse clinicians, instructional designers, and technology specialists are needed. Finally, creativity and a desire to help learners are needed from all involved.

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Innovative Idea

Using YouTube® as a Medium for Teaching Self-Reflection

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Introduction

Engaging students in reflection to promote self-regulated learning is a goal of many university faculty members (Stefani, Clarke, & Littlejohn, 2000). Three major characteristics of self-regulated learning described by Zimmerman (1990) include the use of self-regulated learning strategies, responsiveness to self-oriented feedback about learning progress, and interdependent motivational processes. The metacognitive nature of reflection allows students to critically monitor and evaluate their progress towards achieving learning goals (Schraw, Crippen, & Hartley, 2006). Self-reflection should allow preservice teachers to initiate a cyclic process in which they monitor their teaching performance, develop a plan for improvement, and implement changes. However, most students do not fully self-regulate their learning (Zimmerman, 2000; Pintrich, 2000). Shinn and Briers (2009) stated "pausing to reflect and learn is not a naturally occurring part of our American DNA" (p. 1).

Just as coaches utilize video playback to help professional athletes review past performances to develop improvements for the next competition, so can teacher educators help pre-service teachers with improving their teaching. The recording of pre-service teacher microteaching to engage students in self-reflection is not a new concept for teacher educators. Krysher (2009) stated "it is now a common practice in many institutions for pre-service teachers to reflect upon their experiences by reviewing a video of themselves" (p. 1). However, variety of audio-video media formats used in recording these teaching experiences, expense of media used, and availability of playback equipment have been difficult hurdles for students to maneuver. Further, the available means of utilizing these recordings has changed with the advancement of social websites such as YouTube®. Warner and Thoron (2009) argue that the incorporation of technologies familiar to students should be linked to meaningful learning objectives.

Purpose

The purpose of this poster is to share our experiences in implementing the use of YouTube® as an instructional tool to develop preservice teachers' reflection skills at [Land Grant University].

How it Works / Methodology

During the methods course prior to student teaching, preservice agricultural education teachers were required to prepare lesson plans and deliver segments of these lessons to their peers. These teaching segments, also known as microteaching, were recorded using a digital video camera so students could view their own teaching and complete a self-reflection exercise. To facilitate the viewing of these teaching segments, the clips were uploaded into a private account on YouTube®. These video clips were not published for public access on YouTube® but were held within the private account. A private access URL for each clip was then provided to each student to access their video clips and complete a self-reflection exercise. The document for self reflection was emailed to the student along with the URL and students emailed the completed self reflection document back to the instructor.

Results to Date / Implications

Self-reflection forms were required from each student for each teaching segment. Over the semester, the depth of self-reflection improved. At first, the comments related to appearance, voice, and gestures. However, toward the end of the semester the reflections focused on student engagement and implementation of teaching strategies. Several students were so pleased with the video clips that they included them in their online teaching portfolios. Because of their familiarity with such media, they were easily able to take the clips from YouTube® and import them into their portfolios.

Student feedback at the conclusion of the course was very positive. One student said, "I appreciated that the camera and YouTube clip could help me monitor my teaching. My favorite part of using YouTube is that the clips are private. Teaching style is something very personal. But because it's so personal, I want to be the best at it that I can and the YouTube video helped aid me in self reflecting on ways to improve." Another student remarked, "I felt that recording our microteachings for self reflection was invaluable. Teachers are constantly needing to self reflect on their teaching - what a great opportunity to do it before you get into the classroom! We were taught to self reflect and successfully critique our teaching through the microteaching recordings. Through the video recordings in my methods class, I was able to create a video to be placed into my electronic portfolio that showcases my teaching styles."

Future Plans / Advice to Others

Based on the feedback from the students and the depth of their self-reflection, we plan to continue using the technology as a means for students to view clips of their teaching and complete the self-reflection exercises. We plan to expand this to other courses in which the students are completing presentations. It is recommended that equipment be used that facilitates efficient transfer of the video clips to YouTube®. The equipment we used is summarized in the next section. It is also recommended that this be used for more than one teaching experience so students can shift their reflection away from personal characteristics and focus on their teaching. One idea for future implementation is the use of a final reflection assignment through which students can compare their teaching experiences throughout the semester and reflect upon their growth. The ability to archive the video clips on YouTube® so students can access these at a later date and view them in sequence will help facilitate this final reflection.

Costs / Resources Needed

The costs involved with this project included the digital video camera and the computer used to upload the clips. We used a Sony Handycam® 240 Gigabyte Hard Drive Camcorder (approximate cost $1,200) to record the microteaching and used iMovie® software on an iMac® computer (approximate cost $1,500) to upload the clips onto YouTube®. Transferring the clips to the computer was at or near real time and all clips could be transferred at one time along the seamless integration of YouTube® with iMovie® minimizing time and labor costs. The account on YouTube® is free and because everything is digital, there are no costs for consumables such as video tapes, DVDs, or memory cards and no issues with finding playback equipment.

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Innovative Idea

Youth Science Literacy and Leadership Development Through the Memorial Middle School Agricultural Extension and Education Center

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Introduction and Need

In an innovative approach to teaching and learning, New Mexico State University (NMSU) and Las Vegas City Schools in New Mexico have developed an educational partnership focused on agriculture, food, and natural resources (AFNR). The Memorial Middle School Agricultural Extension and Education Center (MMSAEEC) is a youth agricultural science center emphasizing participatory learning and experiential education. The MMSAEEC was founded in 2005 and became operational in late 2006. The mission of the center is to develop a model of teaching and learning excellence that complements in-class instruction by providing context to content. Context is linked to content and enhanced through 4-H SET (science, engineering, and technology) and STEM (science, technology, engineering and mathematics) based curricula, activities, and experiments.

In 2007, the National Council for Agricultural Education, started a 10x15 taskforce to identify innovative AFNR education program delivery models. The MMSAEEC is such a model. The center seeks to improve achievement in STEM subjects through hands-on lessons, projects, and experiments undertaken in the MMSAEEC greenhouse and land laboratories. These educational activities are meant to enhance learning in academic classes by grounding academic teachers, their students, and academic content in real-world AFNR contexts.

Development and Current Operation of the Center

The decision to locate the MMSAEEC in Las Vegas, New Mexico was not by chance. Las Vegas has a rich agricultural heritage, but many economic challenges that have left the community underserved. School district data reflect these challenges, as 89% of Memorial Middle School’s 428 students are Hispanic, 66% are economically disadvantaged, and 25% have special needs. Las Vegas City Schools (LCVS) struggles to meet Adequate Yearly Progress as mandated by the No Child Left Behind Act. The middle school was chosen for the center because decision makers felt young people of middle school age are beginning to gain an appreciation for life-long learning, but are also becoming at risk of being left behind.

The center serves all 428 students at the middle school, including the profoundly handicapped. As part of the agreement between NMSU and LVCS, NMSU provides a faculty member and a STEM/4-H agent, and the school district supplies land, a 1,800 square foot greenhouse, and a wet lab to be added in the coming years. Currently, the center works with eight of nine science teachers, as well as teams of teachers to develop cross-curricular approaches to teaching and learning. The goal is help prepare young people for careers in the sciences, particularly for minority students who are underrepresented in these careers, but also to develop students with a variety of skill sets to prepare them for the many unique challenges their generation will certainly encounter in the future.

Preliminary Results and Implications for Research

To date, traditional performance measures are used to monitor student progress. These measures include: quizzes, exams, reports, reflections, indicators of individual improvement, and criterion-referenced test scores. Tentative results suggest that the MMSAEEC model is having an impact on knowledge, skills, motivation, and attitude of students participating in the program. Teacher feedback is promising as well, with teachers reporting improved enthusiasm about learning and a preference by students for the hands-on, applied nature of programming efforts.

These preliminary results are promising, but inconclusive. It is critical that the MMSAEEC be subjected to a rigorous research model to determine its impacts on teaching and learning. The New Mexico Cooperative Extension Service, LVCS, and another Northern New Mexico school district similar to LCVS in student demographics, are cooperating on a four-year quasi-experimental study to compare science achievement, AFNR achievement, leadership life skills development, and career interests between students participating in MMSAEEC learning activities for three years of middle school and students at a comparison middle school who receive their instruction without the agricultural science center enhancements (Skelton & Dormody, 2009).

To date, most of the secondary education research conducted on the impacts of integrating agriculture with science has been descriptive-perceptual research and limited to high school students (Balschweid 2002; Thompson and Warnick 2002). A couple of secondary education studies have employed quasi-experimental and causal comparative research designs to determine the impacts of integrating agriculture with science (Roegge and Russell 1990; Chiasson & Burnett 2001). Research on the impacts of integrating science and agriculture in the secondary curriculum into middle schools fits well within the National Research Agenda for Agricultural Education and Communications (Osborne, 2007). The research also fits well within the SAES National Research Priorities 2005-2010 (SAES/ARD Directors, 2000) in rural community vitality, specifically research in human capital development and access to and application of new technologies.

Future Plans and Advice to Others

The MMSAEEC is an innovative education delivery model with a relevant curriculum that reaches a diverse and underserved community in Northern New Mexico. The research that will be conducted over the next four years on the MMSAEEC will determine if it is a program delivery model that makes a difference in student learning and career choice, and is worthy of diffusion. The research will also assist those developing and implementing the model in improving it to maximize teaching and learning impacts.

For others considering starting a program like this, careful consideration of site is warranted. With school budgets tightening, it will mean that school districts must be ever more vigilant in allocating resources. Yet, there are many opportunities for extramural funding that can ease the fiscal constraints a program like this can impose on a school district.

Budget and Resources Needed

The MMSAEEC is funded primarily through a legislative appropriation and has two full-time positions: a director of the program and assistant. Facilities include: a greenhouse, 640 square feet of raised bed gardens, a 0.5 acre experimental row crop field, a 1 acre fruit orchard, and a 2.3 acre learning landscape with a nature trail and demonstration gardens (to be developed). Community support has been vital in developing the landscape, as community members have donated time and money to develop the nature trail. Mechanical preparation of the fields is provided by the Adelante Resource Conservation and Development District (RC&D) through an exchange with the center for greenhouse space for RC&D conservation plantings. Finally, grant funding has assisted in the purchase of appropriate technologies, resources, and equipment necessary to further the goals of the MMSAEEC.

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Research

Agricultural Mechanics Experience of Texas Agricultural Education Student Teachers

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Introduction

The use of school agricultural mechanics laboratories, where students employ learning by doing, is an integral part of many agricultural education programs (Sutphin, 1984). However, many teachers have limited agricultural mechanics experience prior to beginning a career in education. With the continuing popularity of agricultural mechanics classes in Texas (Texas Education Agency, 2009), research was conducted to determine the amount and type of agricultural mechanics experience of Texas agricultural education student teachers. Researchers utilized a mailed questionnaire to conduct this descriptive, census study.

Theoretical Framework

Agricultural education laboratories are an essential component of the total secondary agricultural education program (Phipps & Osborne, 1988). The use of school and community laboratories, where students employ "learning by doing" is an integral part of many agricultural education programs (Sutphin, 1984). Hubert, Ullrich, Lindner and Murphy (2003) stated "agricultural education programs offer many unique hands-on opportunities for students to develop both valuable academic and vocational skills" (p. 17). Phipps and Osborne also noted that "the primary objective of agricultural mechanics education is the development of the abilities necessary to perform the mechanical activities to be done in agriculture" (p. 306).

Knowledge and skills associated with agricultural mechanics laboratory management are essential for agricultural educators who intend to provide a safe and efficient laboratory learning environment for agricultural mechanics students (Saucier, Schumacher, Funkenbusch, Terry, & Johnson, 2008). Many studies have revealed that teachers need professional development in the area of agricultural mechanics laboratory management (Johnson, Schumacher, & Stewart, 1990; Schlautman & Silletto, 1992; Fletcher & Miller, 1995; Saucier, Terry, & Schumacher, 2009). Due to the continued need for quality and current professional development education for teachers (Osborne, 2007) and the lack of research regarding the agricultural mechanics professional development needs of Texas agricultural education student teachers, there was a need for this study.

Methodology

The purpose of this research study was to determine the agricultural mechanics experience of Texas agricultural education student teachers.

1. Identify selected demographic characteristics of Texas agricultural education student teachers who will potentially supervise agricultural mechanics laboratories in their chosen career of education.

The population for this study was composed of all Texas agricultural education student teachers in the spring of 2009 (*N* = 98). Teacher educators at each of the state's ten agricultural education programs assisted in the identification of the frame. A census of these teachers was conducted with usable responses received from 57 (58.16%) teachers. This study was extracted from a larger research project designed to assess the agricultural mechanics laboratory management in-service needs of Texas agricultural education student teachers. The data collection instrument developed by Saucier, Terry, and Schumacher (2009) for a similar study was modified for use with this research. Appropriate methods were used to determine the validity and reliability of the instrument including the use of a panel of experts and a pilot study. Data were collected following Dillman's Tailored Design Method (2007).

Findings

Texas agricultural education student teachers were mostly female (*n* = 31; 55.40%), identified with being of White ethnicity (*n* = 50; 89.30%) and their median age was 22 years (*M* = 24.03; *SD* = 4.86). On average, Texas teachers completed 9.69 university semester credit hours of agricultural mechanics instruction at the university level. Many of these teachers were agricultural education majors (*n* = 37; 64.90%) as undergraduate students in college. As a youth, most teachers were FFA members (*n* = 49, 87.50%) and some were involved in 4-H (*n* = 22, 38.60%). A third of the respondents (*n* = 19; 33.30%) also had an agricultural mechanics Supervised Agricultural Experience (S.A.E.) project in high school. Of the eleven, agricultural mechanics courses offered in Texas agricultural education programs; there was an average enrollment of 17 (30.30%) respondents in each course.

Conclusions, Implications, and Recommendations

Agricultural education student teachers in Texas were mostly female, in their early twenties, and identified with being of White ethnicity. These teachers also had earned almost 10 semester credit hours of agricultural mechanics coursework and majored in agricultural education. Many of these teachers were involved in the National FFA Organization and 4-H as a youth. A third of the teachers had an agricultural mechanics S.A.E. project in high school and were enrolled in an agricultural mechanics course.

Implications from this research are very important to the longevity of early career teachers and the overall welfare of their students who work and learn in an agricultural mechanics laboratory. By understanding the knowledge level of these new teachers, adequate and timely professional development opportunities can and should be developed. These in-service education opportunities should focus on skill acquisition, laboratory management, and student safety.

Agricultural education faculty, state agricultural education supervisors and local school administrators should offer in-service education programs for current and future Texas agricultural science teachers who are responsible for managing and instructing students in an agricultural mechanics laboratory. Furthermore, future research should be conducted to determine the need for highly qualified agricultural mechanics teachers in school-based agricultural education programs throughout the United States. Additionally, researchers should identify a nationally recognized list of agricultural mechanics skill competencies for new agricultural education teachers. These competencies should then serve as a "measuring stick" for graduates and could later be used to identify the professional development needs of early career teachers and areas for improvement of teacher education programs across the U.S.

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Research

Becoming Teachers: Beliefs, Attitudes, and Intent to Teach Agricultural Education

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Introduction

Recruiting students into agricultural education teacher education programs is a critical component in maintaining and growing secondary agricultural education programs across the country. A national study of the supply and demand for Agricultural Education, Kantrovich (2007) reported that almost half of new teacher education graduates in agricultural education chose careers other than classroom teaching. This becomes problematic as the number of positions are either left unfilled, are closed entirely, or administrators are forced to hire uncertified or alternatively certified teachers (Roberts & Dyer, 2004).The strength of the agricultural education profession hinges on several variables including state and federal legislation, funding, public perception and local administration, but also on the recruitment of graduates into the profession (Kantrovich). For teacher educators to continue to recruit students into their programs, the factors that influence students' decisions to teach secondary agricultural education must be learned.

Theoretical Framework

Fishbein and Ajzen (1975) provide the framework for which to better understand antecedents to behaviors. Furthermore, the Expectancy-Value theory is directly linked to Fishbein and Ajzen's theory with the core belief that behavior is a function of the expectancies an individual has and the value of the goal toward which the individual is working (Watt & Richardson, 2007). The Expectancy-Value theory is the overarching theory in which this study is based upon.

Additionally, the Factors Influencing Teaching-Choice (FIT-Choice®) framework provides a comprehensive model to guide systematic investigation into the question of why people choose teaching (Richardson & Watt, 2006). The FIT-Choice® framework determines the strength of influence for a range of attitude, motivation and intent from individuals choosing teaching as a career, this framework, founded on the Expectancy-Value theory, provides a comprehensive model to guide systematic investigation into the question of why people choose teaching as a career (Richardson & Watt). Understanding students' motivations for choosing a teaching as a career has implications for teacher education, curriculum design, and recruitment.

Methodology

This study utilized a nonexperimental descriptive-correlational research design method to meet the purpose and research objectives of the study. Twenty-six teacher education programs within Arkansas, Illinois, Iowa, Kansas, Kentucky, Missouri, Nebraska, Oklahoma, and Tennessee were initially identified from the American Association for Agricultural Education Directory (2007). Of the 26 teacher education programs within the nine-state area, 19 programs were included in the study. The selection criterion was access to senior-level level agricultural education majors who were to participate in student teaching during the fall of 2008 and was established *a priori*. Because students in these programs tend to be defined cohort groups, arguably, cohorts for subsequent years are likely to represent similar dispositions. Consequently, this study is viewed as a time and place sample.

The data collection instrument was adapted from the FIT-Choice® Scale (Watt & Richardson, 2007). Section one included 40 statements designed to collect data related to students' attitude toward becoming a secondary agricultural education teacher, section two included 15 items to collect data related to students' beliefs about teaching, section three included six statements related to students' intent to teach. Section four included demographic items. To ensure validity of the instrument a panel of experts reviewed it for face, content, and construct validity. Additionally, the instrument was pilot tested prior to distribution to address reliability. Reliability estimates ranged from .50 to .90. Results include a response rate of 93% as 18 of the 19 institutions that initially agreed to participate returned questionnaires for a total of 145 data points (n = 145). Data were analyzed using SPSS® 15.0 for Windows.

Results

Findings indicate that students' beliefs about teaching regard it an "expert career" and one that has a high "social status." Students' had an overall positive attitude about teaching and view the job as a way to make "social contributions," have had "positive teaching and learning experiences," have the "ability" to teach, and enjoy "working with adolescents." Students' on average are satisfied with their choice to become an agriculture teacher. Correlations between the sub-constructs of attitude, beliefs, intent and selected demographics revealed no strong relationships. Stepwise multiple linear regression revealed no variance in students' intent to teach and the selected characteristics of sex, perceived agriculture experience compared to their peers, years enrolled in school-based agricultural education courses, years of FFA membership, participation in SAE, and years of 4-H membership. Eleven percent of students' intent to teach can be explained by the belief sub-constructs of "teacher morale" and "expert career." Additionally, four sub-constructs of attitude including "fallback career," "working with adolescents," "intrinsic career value" and "job security" account for 61% of the variance in students' intent to teach. Finally, 11% of students' intent to teach can be accounted for by the variance in attitude about teaching agriculture education when controlling for beliefs.

Recommendations

As a result of this study, teacher educators should continue to recruit students from typical sources (i.e. existing agricultural education programs) and begin to explore recruiting from "atypical" populations including urban, suburban and rural areas where no agricultural education programs are offered. Teacher educators should also concentrate on enhancing early, positive field experiences. The marketing of teaching agricultural education should include the positive aspects of the job, such as the opportunity to work with adolescents, job security, and as one where teachers are well-respected. Teacher educators should tailor students' programs of study to incorporate technical coursework from areas the students' need more experience in. Additionally, those interested should promote agricultural education as a career that is a match for students if they have a passion for teaching, want to work with adolescents and want a job that offers a steady career path. Finally, future research should continue to seek understanding about the factors that influence students' choice to teach agricultural education.

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Research

Effectiveness of Integrating Video Clips into the Secondary Agricultural Education Curriculum

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Introduction/Need for Research

Secondary students today are considered members of the Millennial Generation (born in or after 1982). Members of this generation are quite different from previous generations because Millennials have grown up with media and technology and are naturally technology savvy (Kaiser Family Foundation, 2005). In a learning environment, members of this generation appreciate teamwork, experiential activities, structure, entertainment, and technology (Raines, 2002). When educating the Millennial Generation, McGlynn (2005) said more research is necessary to develop new teaching strategies, to adjust current practices, and to investigate how to effectively use technology to improve learning.

Researchers have studied the use of feature films to teach a number of concepts in a college setting. However, showing an entire feature film takes up a great deal of time and may not be realistic to meet course learning objectives. Roskos-Ewoldsen & Roskos-Ewoldsen (2001) found that using shorter video clips in an undergraduate psychology class helped students understand the concepts, made the concepts covered more realistic, and overall, made the course more enjoyable. However, few studies have examined the pedagogical effectiveness of using video clips (Roskos-Ewoldsen & Roskos-Ewoldsen, 2001).

The *National Research Agenda for Agricultural Education & Communication* (Osborne, n.d.) recognized the need to determine what instructional strategies improve student achievement in school-based agricultural education. The purpose of this study was to examine the effect of integrating video clips in the secondary agricultural education curriculum. The following research objectives were used to address this purpose: 1) To determine subjects' attitudes of integrating video clips into the agricultural education curriculum and 2) To determine subjects' satisfaction when video clips were used compared to when they were not.

Theoretical Framework

This study derived its theoretical framework from Bandura's (1986) social cognitive theory that states that learning can occur enactively or vicariously. Enactive learning involves actual doing and learning from one's own experience. Vicarious learning occurs when the learner does not overtly perform the behavior, but observes the behavior through other sources. Common sources for vicarious learning include observing or listening to individuals, symbolic representations (e.g., cartoon characters), printed materials (e.g. books), and electronic sources (e.g. television, videotape). Vicarious sources of information make learning more possible than if someone had to perform all the behaviors individually (Schunk, 2004). The integration of video clips into educational curriculum therefore provides a source for vicarious learning.

Methods and Procedures

This study used a quasi-experiment counterbalanced design in which all subjects receive the experimental treatment at some time during the experiment. This design is used with intact class groups to reduce any differences that exist between the groups (Ary, Jacobs, & Razavieh, 2002). Subjects were high school students enrolled in two sections of the same course, *Animal Science*, during the spring 2009 semester. Subjects were normally enrolled in these two sections and were not reassigned for this study. One section had seven students and the other section had 12 for a total of 19 subjects.

The treatment consisted of embedding video clips into two animal science units – horse and swine. The video clips were from a variety of television shows (such as *Dirty Jobs* and *Modern Marvels*) and online clips from YouTube and United Streaming. Each of the units was two-weeks in length and was similar in the nature and difficulty of the concepts. Each unit had the following lessons: industry, history, breeds, feeding, management, housing, tack (equipment), diseases and parasites. The horse unit included anatomy, selection, horsemanship and training while the swine unit included lessons on production systems and marketing.

The class section that was randomly assigned to receive the treatment for the first unit (Group 1) served as the control for the second unit (Group 2) and vice versa. The control group was taught the same content using more traditional methods and no additional video clips. Subjects completed a 15-item satisfaction instrument adapted from Brashears (2004) and Alexander (2007) at the end of each unit. Students who were in the class that received the video clip treatment also completed an instrument adapted from Roskos-Ewoldsen and Roskos-Ewoldsen (2001) to provide their opinions regarding the use of video clips. Finally, a series of demographic questions were asked to determine age, gender, year in school, and GPA.

Findings

Data were analyzed using SPSS 17.0 for Windows. Of the 19 subjects, 12 were male (63.2%) and the average age was 16.58 (SD = 1.07). Eleven of the subjects were sophomores (57.9%), 3 were juniors (15.8%), and 5 were seniors (26.3%). The average GPA was 3.17 (SD = .47).

Attitudes toward the use of video clips were measured using an 8-item Likert-type scale (1=strongly disagree, 5=strongly disagree) with post hoc reliability alpha coefficient of .928. The average score for video satisfaction was 4.05 (SD = .83). A dependent t-test found no significant difference in satisfaction when video clips were used (M = 3.95, SD = .77) and when they were not (M = 3.83, SD = .69), $t(18)$ = .926, p value = .367, r = .71).

Conclusions

Students in the study were generally positive regarding the use of video clips in the two agricultural education curriculum units under investigation and agreed that video clips should be used in the future. However, there was not a significant difference in overall satisfaction between when video clips were used and when they were not.

Implications/Recommendations/Impact on Profession

The results of this study indicate that while students enjoyed the use of video clips in the agricultural education classroom, the use of video clips did not significantly impact overall attitudes of satisfaction regarding the class. It is recommended that the units be used again with larger classes to further examine the effect of integrating video clips on student satisfaction and academic achievement. It would also be beneficial to determine the current prevalence of video clips in school-based agricultural education including teacher's reasons for adoption or barriers to integration.

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Research

Exploring an Integrated System Approach to Food Security in Developing Countries: A Grounded Theory Study

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Introduction

The Food and Agricultural Organization of the United Nations (2008) estimated that the number of hungry people in the world equaled 923 million in 2007, an increase of more than 80 million since 1990. Evans (1998) forecasted that by 2020, 82% of the world population will live in developing countries. The paradox of starvation in underdeveloped nations amidst abundant food in developed countries is evident. Food security and sustainability remain among the major challenges facing institutions serving agricultural development in developing countries.

Agriculture with its modern technologies and policies, exemplified through the Green Revolution, has not provided a sustainable solution to food security. For example, Africa largely missed out on the Green Revolution (Gates, 2009). All the while, world forces of population growth, environmental degradation, migration-immigration, technology, and global terrorism created system chaos. As system problems demand systems solutions, this research proposes that food security can better be addressed through an integrated system approach that recognizes the individual yet interactive roles of food production, agricultural research and technology, education and training, transparency, and policy.

The research also recognizes that the actual and potential target audience for agricultural education has expanded through the process of globalization. In accordance with the National Research Agenda (Osborne, n.d.) for agricultural education in international settings, an integrated system approach to food security was developed to expand the educational focus in addressing various needs of stakeholders in that system.

Theoretical framework

Strauss and Corbin (1998) wrote that when a researcher hopes or intends to generate a theory formed inductively from data collected during a study rather than using a theory to frame the study, the researcher is conducting a grounded theory study. This research project began with data collected through one-on-one interviews, focus group discussions, and participant observations—all aimed at answering a question about best practices and approaches to preventing hunger and improving human living conditions. A theory of an integrated system approach to food security emerged from the data analysis and interpretation.

Methodology

The one-on-one interviews were conducted with ten different experts who have extensive work experience in international agricultural development. Each interviewee represented an institution serving international agricultural development, which included the Food and Agriculture Organization of the United Nations, the Gates Foundation, the Norman Borlaug Institute for International Agriculture at Texas A&M University, Food for the Hungry, and the U.S. Department of State. The focus groups were conducted as roundtable discussions between the researchers and the two advising professors. The researchers then conducted literature reviews of individual themes that had emerged. To move toward generating a grounded theory, the researchers used the *constant comparative method* as part of the interactive and ongoing process of analyzing the data and developing the theory (Glaser, 1992).

Findings

Data from the one-on-one interviews, focus groups, and participant observations yielded five individual themes—food production, research and technology, education and training, transparency, and policy. Results of the literature review, bounded and limited by the five themes that emerged, pointed the researchers toward an encompassing theme of an integrated system approach to food security. The individual system components demonstrate that food security concerns not only individual farmers and the ecological paradigm, but also the fabric of agricultural and rural communities, institutions, and governments at the local, regional, national, and global levels. The interconnectedness among these components can be perceived through a hierarchy of agricultural systems. The components of food production, agricultural research and technology, and education and training address food security directly at the lower three levels—farming, cropping, and soil systems. These components contribute primarily to ecological sustainability and agricultural productivity. On the other hand, corruption and policy issues affect food security more directly at the upper three levels—regional, national, and global systems. These components enable or hinder economic viability, access, and social equity of food production and distribution. As a whole, all of the individual components interact to inform and support one another for the long-term goals of food security and agricultural sustainability.

Conclusions

Food security and sustainable agriculture achieved through an integrated system approach will remain an evolving and adapting process. The core elements of sustainability consist of ecological soundness, food productivity, economic viability, and social equity (Raman, 2006). The system components interact and balance uniquely depending on specific local, national, regional, and global contexts. Although countries and organizations worldwide may share criteria for sustainability, we should expect to see a variety of integrated approaches to sustainability along with their changes over time. Each country or region with its own stage of growth and its unique ecological, socioeconomic, and political conditions may have its own methods of balancing the system components. Countries in different times and conditions need different approaches to food security. A one-size-fits-all policy, or advice implying such a policy, will likely retard rather than advance agricultural development.

Implications, Impacts, and Recommendations

This integrated system approach has implications for university research, teaching, and extension functions in the U.S. and for foreign institutions performing those functions. The research contributed to identifying the core knowledge and understandings required for participatory, interdisciplinary, and institutional collaboration in the agri-food and natural resource system—locally, regionally, nationally, and globally. The researchers recommend that further research continue in the development of a framework for an integrated system approach to food security. To reinforce and expand the framework, we recommend that future researchers explore the inclusion of additional life system components such as health and economics.

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Research

Identifying Graduate Students' Areas of Concern

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Introduction/Need for Research

The transition to graduate school can be very stressful for students, whether they are entering directly from an undergraduate program or from the workforce. Tokuno (2008) said the common belief that graduate students do not need additional support because they have already successfully completed an undergraduate program is incorrect. Providing assistance with the transition to graduate school may help improve the retention of graduate students and help them graduate on time. Ferrer deValero (2001) said an orientation course or seminars should be offered to help explain the intricacies of graduate school including paper writing and publishing, applying for grants, and learning how research is conducted.

The *National Research Agenda in Agricultural Education and Communications* (Osborne, n.d.) addressed the need for additional research to improve the success of students enrolled in agricultural and life sciences programs. The purpose of this study was to identify graduate students common areas of concerns regarding various aspects of their graduate school experience. Once these topics are identified, additional opportunities can be provided to decrease anxiety and improve student performance.

Theoretical Framework

Self-efficacy is "beliefs in one's capabilities to organize and execute the courses of action required to produce given attainments" (Bandura, 1997, p.3). This concept is of particular importance to education because people with higher levels of self-efficacy perform better at whatever the task may be. Schunk (2001) said self-efficacy can influence behaviors such as persistence, skill acquisition, effort expenditure, and choice of tasks.

Methodology

The population for this study included all graduate students on assistantship in the Agricultural Education & Communications Department at a southwest university. The researcher-developed survey instrument was distributed during a required orientation session before the Fall 2009 semester. The instrument had 41 questions that addressed a variety of tasks and/ or responsibilities graduate students often encounter during their time in graduate school. The instrument was divided into six sections: 1) Ins and Outs of Grad School, 2) Writing for an Academic Audience, 3) Locating and Reporting Research, 4) Presenting Research, 5) Evaluating Research, and 6) Computer Skills. Questions within each of these sections asked students to rank how confident they were performing certain tasks on a five-point Likert-type scale (*1=not confident at all* to *5=extremely confident*). A panel of experts was used to establish face and content validity of the instrument. Post-hoc analysis using Cronbach's alpha found the reliability of the individual constructs ranged from 0.77 to 0.98. Additional questions were asked to identify where assistance on the topics could be provided. Finally, several demographic questions were asked. Data were analyzed using SPSS 17.0 for Windows™.

Results/Findings

Of the 21 students who completed the instrument, 13 (61.9%) were master's students while the remaining 8 (38.1%) were working on a doctoral degree. Only six students (28.6%) were in their first semester at the university and nine (42.9%) had already completed the introductory research methods class taught in the department. Table 1 provides the six topics that received the lowest mean confidence scores while the highest mean confidence scores are displayed in Table 2.

Table 1.
Topics that received the lowest mean confidence scores

Topic	N	Mean	SD
Identify where your research fits in the *National Research Agenda for Agricultural Education and Communication*	21	2.81	1.40
Use SPSS to analyze research data	20	2.90	1.48
Design a research poster	20	3.00	1.34
Effectively present a research paper at a research conference	20	3.05	1.54
Write a research poster narrative	20	3.10	1.29
Explain the procedure for the Institutional Review Board [University]	20	3.10	1.55

Table 2.
Topics that received the highest mean confidence scores

Topic	N	Mean	SD
Use Microsoft Word to format tables	20	4.35	0.75
Develop a research presentation using Microsoft PowerPoint	20	4.35	0.88
Use Microsoft Word to format your writing (hanging indents, block quotes, etc.)	20	4.35	0.93
Name professional associations you should join as a graduate student	21	4.24	0.94
Use the physical library to find supporting research	21	4.14	1.15
Use electronic databases to find supporting research	21	4.05	1.16

The majority of students (n = 19, 90.5%) said they wanted additional training to address the mentioned topics. The most commonly preferred ways to receive additional training or support was in a specific course, such as a graduate seminar, (n = 13, 61.9%) followed by brown bag sessions (n = 9, 42.9%).

Conclusions

Students in this study indicated a number of areas where additional training or support is needed. The main concerns dealt with presenting research and the ins and outs of graduate school.

Students were more confident in their ability to use computer programs such as Microsoft Word and PowerPoint. Students indicated that additional training or support should be provided in brown bag sessions and courses centered on a topic of interest (i.e. poster development and design).

Implications/Recommendations/Impact on Profession

As Tokuno (2008) said, graduate students need additional support to be successful and academic units should develop strategies to address areas of concern. Further research is needed with a larger sample of graduate students in agricultural education and communications to determine if the concerns identified in this study are shared with others. Additional professional development opportunities could then be developed at a local, regional or national level to address these concerns in order to help graduate students succeed in their graduate program.

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Research

Important and Implemented Quality Indicators of Supervised Agricultural Experience Programs: Perceptions of Stakeholders

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Introduction

One of three tenants of school-based agricultural education, Supervised Agricultural Experience (SAE) programs are "practical agricultural activities of educational value conducted by students outside of the regular class or laboratory instructional time for which systematic instruction and supervision are provided by the teacher, parent, employer and others" (National Council for Agricultural Education, 2007, p. 64). The value of SAE programs is that it allows students of varying abilities, aspirations, and backgrounds to enhance their participation and understanding of agriculture (Hughes & Barrick, 1993), to improve desirable work habits and to develop student responsibility (Stewart & Birkenholtz, 1991).

A scarcity of educational resources for supervision, a changing clientele (students) and personnel (teachers and administrators) in secondary agricultural education programs and concerns regarding the future of agriculture have impacted SAE programs (Enns, 2008). Given the decline in SAE programs (Steele, 1997) determining if current quality indicators of SAE programs are still important and implemented is critical to future success.

Theoretical Framework

Quality indicators of SAE programs have been defined many times including in the National Quality Program Standards (National Council for Agricultural Education, 2007). Research has refined quality indicators around planning and supervision (Swortzel, 1996; Dyer & Williams, 1997) , recordkeeping and implementation (Jenkins & Kitchel, 2009) and providing parameters for size, scope and linkage to career goals and agricultural education curriculum (National Council for Agricultural Education, n.d.; Colorado Community College System, 2003). SAE programs and their quality indicators necessitate in-service training for teachers (Joerger, 2002; Ricketts, Duncan, Peake & Uesseler, 2005). Perhaps this explains why educators fail to utilize SAE programs and their quality indicators as intended (Dyer & Osborne, 1995).

Method

The purpose of this study is was to determine whether quality indicators previously reported in SAE research are currently important and/or implemented in agricultural education programs. Data was collected utilizing a researcher-developed survey with SAE data part of a larger study of agricultural education sustainability. Nominal categories were listed as possible responses to each of the quality indicators of SAE: "Important and Implemented," "Important, Not Implemented," "Not Important, Implemented," or "Not Important, Not Implemented." To ensure questionnaire would yield trustworthy data, content and face validity were determined by a panel of individuals with expertise in survey development and agricultural education programs. The Cronbach's Alpha for SAE and Experiential Learning survey is .854, indicating a reliable measure of internal consistency.

Data was collected through an internet survey provider and through mailed response surveys. Procedures employed to insure appropriate response (and prevent non-response error) were: pre-notice letter, cover letter with survey, follow up email reminder, second follow up email reminder and final post card reminder following Dillmans' recommendations (2000).

Results/Findings

The response rate for administrators was 64.6%, advisory committee members was 41.7% and for agriculture teachers was 82.5%. Data was re-coded to be Important or Not Important or Implemented or Not Implemented after an initial analysis for all respondents (N=225). Frequency counts and percentages were compared for each quality indicator.

Over 75 percent of respondents (all stakeholder groups combined) felt all 17 quality indicators of SAE were important. Three quality indicators, "SAE's last over 6 months," "Adequate evidence of SAE visits is maintained," and "SAE is integrated into the curriculum" were viewed as important by over 90 percent of the respondents. The lowest frequency responses were from quality indicators of "The instructor conducts three visits to students SAE yearly" and "Students enrolling in Ag Ed are visited before the first school year." On average, 10 percent of the respondents did not respond to a given quality indicator as either "Important" or "Not Important."

The percent of respondents which believed quality indicators were implemented showed far greater variability. The SAE quality indicator that was perceived to be implemented most (84.4 percent) was "SAE and work-based learning is integrated into the curriculum." while 51.6 percent of the respondents perceived the quality indicator of "The instructor conducts three visits to students SAE yearly" was not implemented.

The greatest difference in percentages of stakeholders who believed SAE characteristic was important to those implemented were the quality indicators of "The instructor conducts three visits to students SAE yearly," "Students enrolling in Ag Ed are visited before the first school year" and "SAE's last over 6 months," "Adequate evidence of SAE visits is maintained," and "All students have a viable SAE program."

Implications and Recommendations

This study on SAE programs confirms that the quality indicators presented were important to stakeholders in agricultural education. Any changes in SAE and their identifying quality indicators should consider historical indicators considered valuable. Dichotomous to this is that fewer stakeholders felt the quality indicators were being implemented. While SAE and quality indicators that have historically defined SAE are still valued, the ability to implement is becoming more challenging.

Professional development opportunities on creative SAE programs and supervision activities may improve the implementation of certain quality indicators. Given the percentage of non-responses, it is hypothesized that this could be due to lack of knowledge and understanding on behalf of stakeholders. It is suggested that professional development on marketing and promoting communication to stakeholders on the activities surrounding SAEs take place.

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Research

Improving Undergraduate Curriculum: What do our Alumni Think?

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Introduction/Need

As with other media professions, agricultural communications is a swiftly changing field. As the nature of the profession changes, so must the programs designed to educate students about it change. When considering what should be updated about a program, alumni from that program who are currently pursuing careers in the field may have some of the best insights. Thus, this study utilized a focus group composed of alumni from the agricultural education and communications department of a southern university in order to obtain relevant data.

Conceptual Framework

As stated, agricultural communications programs should frequently review and update their curriculum in order to ensure that their programs are providing the best possible education and career preparation for their students (Akers, 2000). Previous research (Sprecker & Rudd, 1998; Sitton, Cartmell, & Sargent, 2005; Telg & Irani, 2005; Doerfert & Miller, 2006; Corner & Cole, 2008a; Corner & Cole, 2008b; Irlbeck & Akers, 2009) suggests that recent college graduates need to improve in several areas, such as writing, critical thinking, work place etiquette, time management, photography, and Web design. However, while this information is useful, it was conducted on a nationwide level and individual facets of these findings may not apply to each individual university. Thus, a focus group of alumni from the specified department was determined to have the most validity when considering their particular case.

Methodology

The purpose of this study was to collect data about the agricultural communications program at a southern university. The objectives were to use this data to improve further curriculum and to address any other concerns the alumni had about the program and their degrees in general.

This qualitative research study utilized a focus group method with a moderator to collect data. Five focus group members were chosen from alumni of the department. These alumni were chosen from those whom the department had been keeping in touch with and who currently had careers in the field. These members were selected because they had accomplished the end goal of the department's program, which is obtaining a career in the field. This also allowed focus group subjects to offer insight on how to modify the curriculum to better prepare students for careers in the industry.

Questions developed by the researchers were selected in order to cover most aspects of the program, including asking whether the focus group members found certain aspects of their education helpful or unhelpful in their careers. This was expanded upon with questions about specific classes and suggestions on classes or topics that could be added, and questions about internships. Finally questions were asked that covered what trends and career knowledge should be taught, with a final question to bring the discussion to a close—"what do you know now that you wished you knew then?"

Findings

The focus group subjects were fairly unified on many topics that were discussed during the actual focus group. Using an analysis aided by NVivo software, each subject's comments were coded and analyzed. Individual mentions of particular topics were counted among all the comments given by the members of the focus group. The most important topic to the subjects was career preparation and the focus of course curriculum, followed by the necessity of design-oriented classes, learning to use various kinds of technology and software, and concerns over the attitudes displayed by new graduates or interns. Other topics were discussed and were important to the attendees, but did not receive as many overall mentions. Some of these other important topics were internships, media campaign classes, the importance of portfolios, and the importance of writing.

The findings indicated that the subjects were pleased with the level of advisement received and were, overall, somewhat pleased with how their education had prepared them for their careers. However, they expressed concern over how their educational experiences had not gone into depth on some areas that would have been helpful in their careers (and, in most cases, the subjects ended up independently studying those areas after graduation). They expressed concern over the internship process and how it was possible to obtain credit without completing an internship that actually applied to the major or helped prepare students for the workforce. In addition, they expressed concern over the attitudes of those entering the workforce and of interns that they had made contact with during their careers, indicating that the program should provide more information to prepare students for the daily details of their possible future careers and coach them in proper attitudes.

Conclusions

The information gathered from the study suggests that, although the alumni felt that some aspects of their education had been very successful, such as the knowledge of design programs and theories, they felt that their educational experiences had been lacking in practical knowledge that they could have used in their future careers. In addition, the alumni suggested a heavier emphasis on internships to help prepare future students for careers and the opportunity to build a portfolio and have that portfolio critiqued before graduating.

Recommendations

The recommendations from this study suggest that more courses that allow for career preparation and fundamental knowledge should be implemented, or existing courses should have their curriculum modified in order to provide more usable information to the students enrolled in them. The suggestions, coming from those currently employed in the industry, offer real advice on what could be done to better prepare the students currently in the program for a future in similar careers.

For future research, a follow-up study is recommended with another set of alumni to see if the situation has improved from the one described by the focus group subjects. As the job market changes, it is important to study how well the program is working to produce graduates who are marketable.

While this study provides useful suggestions to agricultural communications programs, as this study used a very narrow sample from a particular university, it is suggested other universities conduct their own studies with alumni before taking the results into account. The findings from this study cannot be directly applied to other programs.

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Research

Northwest's Supply & Demand for 2009-2010: Who is filling the Ag Teaching Positions?

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Introduction

Within agricultural education, our country has faced a "very real teacher shortage since the 1960s" (Team AgEd, 2006, p. 24). Considering the documented teacher shortage and closing of agriculture programs, the National Council for Agricultural Education's "Long Range Strategic Goal" proposed the 10 by 15 initiative to have 10,000 quality agricultural education programs by 2015 (Team AgEd, p. 18, 2006) to motivate agricultural teacher education programs to rethink recruitment and retention. Currently there are approximately 8000 secondary agricultural education programs in our country (Team AgEd, 2006). With only 53% of the newly qualified agriculture teachers at the national level projected to enter the field in 2007, "This [teacher shortage trend] has the potential to reach epidemic proportions…" (Kantrovich, 2007, p. 37). The teacher shortage will only become more significant over the coming years.

Theoretical framework

With programs closing because of the teacher shortage, the question was asked, "what can we do to increase the number of graduates who seek teaching careers?" (Team AgEd, 2006, p. 24). To address this important question, "We need to research these questions at all levels (state, regional, and national) in order to find viable solutions" (Team AgEd, 2006, p. 24). Roberts, Harlin, and Ricketts (2006) identified three solutions: (1) increase the number of agricultural education graduates, (2) increase the percent of agricultural education graduates who choose to enter teaching, or (3) find alternative sources to supply agriculture teachers. Due to the lack of accurate empirical evidence, it is unknown which of the options the seven Northwest agricultural teacher education programs should focus their attention on. The three solution model (Roberts, Harlin, & Ricketts, 2006) served as the theoretical framework for this study.

While a national teacher shortage is quite evident in the literature, data does not clearly provide the Northwest a precise outlook on the number of graduates from each Land-Grant Institution and whether they enter the teaching profession, nor does the data identify the number of secondary agricultural education positions in each Northwest state (Idaho, Montana, Nevada, Oregon, Utah, Washington, & Wyoming). The purpose of this study was to capture accurate data as part of a multiyear tracking effort (Swan, 2009) that will provide insight as to where future emphasis should be placed for maximum benefit for the Northwest.

Methodology

Supply and demand data including graduates, open positions throughout each state, and what teacher classifications actually filled those positions were captured through contact with the seven Northwest Land – Grant University agricultural teacher education faculty coordinating the student teaching experience and the state program managers overseeing agricultural education.

Results/Findings

The Northwest Land-Grant Institution's agricultural teacher education programs produced 32 graduates for the 2008-2009 school year and there were 65 full time positions available in the Northwest area for the 2009-2010 school year, possibly filling 49% of those positions. Twenty two of the 32 (69%) 2008-2009 graduates taught secondary agriculture during the 2009-2010 school year (Table 1). Of the 65 positions open in the Northwest, 2 went unfilled (Table 2).

Table 1.
2008 - 2009 Northwest Land-Grant University's agricultural education teaching graduates and secondary positions within their respective state.

Northwest Land-Grant Institutions	2008-2009 AgEd Teaching Graduates		2009-2010 Secondary Ag Ed	
	f	Teaching Secondary Ag	Positions Available	Programs gained or lost
University of Idaho	7	4	5	0
Montana State University	4	3	14	+5
University of Nevada - Reno	0	0	3	0
Oregon State University	4	3	5	0
Utah State University	6	4	11	+4
Washington State University	7	6	15	+1
University of Wyoming	4	2	12	+2
TOTALS	**32**	**22**	**65**	**+12**

Table 2.
2009 – 2010 Northwest agricultural education secondary teaching positions. Where are these individuals entering the positions from within each state?

Northwest States	Movers from		New Teachers from		Returning with experience	Alternatively Certified	**TOTAL Positions Filled**
	within State	outside State	within State	outside State			
Idaho	0	1	2	1	0	1	5
Montana	1	3	2	1	4	3	14
Nevada	0	0	3	0	0	0	3
Oregon	1	0	3	0	1	0	5
Utah	5	0	4	0	0	2	11
Washington	7	0	6	1	0	0	14
Wyoming	5	0	2	4	0	0	11
TOTALS	**19**	**4**	**22**	**7**	**5**	**6**	**63**

Conclusions

The graduates potentially could have filled only one half of the available openings. Another third of the positions were filled with movers and a tenth of the positions were filled with alternatively certified teachers. Without those being alternatively certified and returning with experience, there would have potentially been up to 27 positions not filled in the Northwest.

Implications/Recommendations/Impact on Profession

According to the three solution model (Roberts, Harlin, & Ricketts, 2006), option #1 and #3 are the best solutions. Option #1 refers to more students graduating, inferring that more students need to be pumped into the pipeline from high schools, community colleges, and from other majors within Colleges of Agriculture. Option #2 is not viable, because despite only 10 graduates not teaching secondary agriculture; they would not come close to filling all of the open positions. Option #3 is also viable because they address the alternatively certified teachers entering the profession to filling positions in agricultural education programs. Addressing each solution quickly and efficiently should produce impact on new teachers entering teaching.

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Research

Students' new media use as a basis for advancing agricultural communications curricula

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Introduction

Electronic media have become a primary mode of interpersonal and mass communication during the past decade (Kerawalla, Minocha, Kirkup, & Conole, 2008; Lipsman, 2007; Pfeil, Arjan, & Zaphiris, 2009; Smith, Salaway, & Caruso, 2009), with businesses in multiple industries responding to these trends by increasing their reliance on new media as marketing and public relations tools (Li & Bernoff, 2008). To better prepare students as business professionals and to meet students' expectations for learning as digital natives, instructors have begun incorporating new media and other technologies into curricula (Baird & Fisher, 2005-2006; Kerawalla et al., 2007; Pfeil et al., 2009; Smith et al., 2009). The purpose of this study was to describe students' use of selected new media as a foundation for advancing agricultural communications curricula to better prepare students for evolving social and workplace demands. Objectives of this study were to 1) describe students' use of Facebook, including levels of activity, network members, and use for college courses; 2) describe students' use of LinkedIn, including levels of activity and network members; 3) describe students' use of Twitter, including levels of activity and network members; 4) describe students' use of blogs, including amount of time spent blogging and reading other blogs; and 5) describe students' preferences for use of selected new media in an agricultural communications course.

Conceptual Framework

Trends in the adoption of new media reflect the basic human need to connect with other humans (Li & Bernoff, 2008), as well as the human desire for social capital, or resources created by the connections within social networks that are beneficial to members of the networks (Ellison, Steinfield, & Lampe, 2007). Reasons often identified for using new media include maintaining friendships; making new friends; yielding to social pressures; paying it forward; and following creative, altruistic, inquisitive, and social impulses (Kerawalla et al., 2008; Li & Bernoff, 2008; Pfeil et al., 2009; Smith et al., 2009). The social technographics profile (STP) explains the steadily increasing use of new media (Foregger, 2008; Fox, Zickuhr, & Smith, 2009; Pfeil et al., 2009; Smith, 2009; Smith et al., 2009) to meet these needs by grouping new media users based on their activities (Li & Bernoff, 2008) in a structure similar to Rogers' (2003) theory of adoption. Rogers (2003) placed adopters of technology into the categories of innovator, early adopter, early majority, late majority, and laggards. In comparison, new media users are placed into one of six STP groups: creators, critics, collectors, joiners, spectators, and inactives (Li & Bernoff, 2008). Creators produce electronic media, while critics comment on content. Collectors save electronic media created by others. Joiners maintain a profile on at least one new media site and may visit multiple social networking sites. Spectators watch, read, or listen to electronic media without producing their own content or providing feedback on content produced by others. Inactives do not participate in new media use (Li & Bernoff, 2008).

Methodology

Students' use of selected new media, including Facebook, LinkedIn, Twitter, and blogs, was examined using survey methodology. The target population included 60 students enrolled in an upper-level agricultural communications service course at a land-grant university. The paper-based questionnaire was developed through a review of course curricula and literature describing new media use. A panel of experts established face and content validity of the instrument. A post-hoc reliability analysis performed on scaled items included in the questionnaire produced a Cronbach's alpha of 0.90. Fifty-five students completed the survey, which was administered during a 15-minute portion of the first course lecture after the university drop-add deadline had passed. Descriptive data were used to interpret and describe students' responses.

Findings

The majority (86.7%) of respondents were classified as juniors or seniors, with majors in animal science (34.5%), agricultural education (29.1%), agribusiness (20%), agricultural economics (5.5%), natural resource ecology and management (5.5%), agricultural leadership (3.6%), and food science (1.8%). The majority (85%) of respondents reported having a Facebook account. However, all respondents indicated they did not have accounts with LinkedIn, and nearly all respondents reported they did not have Twitter accounts (92.7%) or blogs (96.4%). Respondents reported the highest levels of activity on Facebook for viewing friends' photos, followed by viewing friends' profile updates, sending messages and/or writing on friends' walls, uploading photos, updating profile information, and reading friends' notes. Respondents' Facebook networks did not include broadcast media outlets (97.9%), print media outlets (91.5%), other news services (89.4%), university news services (74.5%), professional contacts (66.0%), and professional organizations (55.3%). Facebook was rated low as a communication tool for courses. In addition, respondents' indicated low levels of preference for the use of blogs and Twitter as assignments.

Conclusions

The use of selected new media, particularly Facebook, by the respondents is consistent with other studies of college students (Li & Bernoff, 2008; Fox et al., 2009; Pfeil et al., 2008; Smith et al., 2009), although the majority of respondents' participation in at least one type of new media does conflict with reports that about one-quarter of college-age students are inactives (Li & Bernoff, 2008). Respondents' reported levels of activity on Facebook support Li and Bernoff's (2008) description of college-age new media participants as being primarily spectators, as respondents reported the highest levels of activity for viewing friends' content. Respondents' Facebook activities also could classify them as critics and creators, with spectators and critics more strongly represented than creators. The low value placed on the use of Facebook, blogging, and Twitter in coursework does agree with other studies that reported college students prefer face-to-face contact and moderate amounts of technology incorporation into curricula (Boyd, 2006; Kerawalla et al., 2008; Smith et al., 2009).

Recommendations and Implications

This study demonstrated that college students enrolled in the selected agricultural communications course are frequent users of certain types of new media but may not be familiar with or comfortable with using other types of new media. Incorporation of new media into curricula should be planned with attention to students' experiences and preferences in combination with the use of new media in various professions. Assignments involving new media should include detailed background and instructions for using the selected media, as well as examples demonstrating the use of new media in careers related to students' education. Meeting these needs will be vital to strengthening students' preparation to face constantly evolving technology throughout their careers and contribute successfully to the development of social capital on personal and professional levels.

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Research

The Importance of Mentoring to Distance Graduate Students

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Introduction

Distance education is becoming increasingly more popular as these processes and techniques make higher education available to additional learners. Enrollment increases in online courses have outpaced enrollment increases for higher education in general for several years with over 3.9 million students taking an online course during the fall 2007 semester (Allen & Seaman, 2008). One of the most attractive aspects of online learning is that it allows adults to pursue their education, arranging it around their everyday lives (Vrasidas & McIsaac, 2000).

Distance education, built upon a unique relationship between learners and instructors, calls for a qualitatively new pedagogy (Huang, 2002). Online learning presents many obstacles for adults who have little else but classroom exposure for their learning environment. Smith (as cited in Bernard, Brauer, Abrami, & Sturkes, 2004) is quoted as stating, “With an increasingly diverse range of pedagogical methods being employed by academics, little that students have previously learned in traditional classrooms has prepared them for the era of online learning” (p. 43). For beginning students, universities have created a number of opportunities designed to transition the new recruit to university life. Each of these efforts, whether at the undergraduate or graduate level, is designed to increase the retention percentage of each new group of students.

Conceptual or theoretical framework

Literature has suggested that university students are developing the skill sets needed to succeed in an online learning environment, but authors agree that as universities plan and deliver their academic programs, they need to address this issue in a formal way (Oliver, 2001). Stokes, Basford, and Cannavina (2004) found that students lack the educational readiness for interactive learning media. They also report that these students have the transferable skills and enthusiasm to enable the use of those skills in future learning situations.

One of the strategies for graduate student success that has been almost ignored for distance students is mentoring. Interest in mentoring, both scholarly and popular interest, has increased dramatically over the past two decades. The American Psychological Society (1999) stated that “one of the most rewarding and important relationships a researcher can have is with his or her mentor” (p. 1) and that “scientists are in need of mentors at many stages of their career but particularly in undergraduate and graduate study” (p. 18). Tenenbaum, Crosby, and Gliner (2001) found that three factors (networking, instrumental, and psychological help) explained 63% of the variance in advisement satisfaction. The researchers also found that practical help influenced students’ scholarly productivity. Yet with this increased interest and stated importance of the mentoring process in graduate education, there is a dearth of literature in the mentoring of distance students.

Methodology

The population for this study is students who began their distance-delivered graduate program during Fall 2009 and for the two subsequent recruitment cohorts. Each student admitted to the cohort was provided with a faculty advocate to serve as his or her point of contact and mentor to the degree program until the student formally selected his or her graduate committee chair.

For the complete longitudinal study, data will be collected from three consecutive recruitment classes at specified intervals during their respective graduate programs. Reported in this poster are the initial findings from two iterations of the instrument administered to the initial cohort admitted in May 2009 and who began the degree program in August 2009 with a face-to-face orientation program.

Data was collected from students just before their orientation meeting and three weeks after the start of their first semester. Students were emailed a link to an online instrument designed by the researchers. The first section of the instrument consisted of items developed by Dreher and Ash (1990) and modified by Tenenbaum, Crosby, and Gliner (2001). These items focused on the extent the student's advocate or mentor had completed various psychosocial, instrumental, and networking needs. Students indicated their responses using a Likert-type scale ranging from *not at all* to *great extent*. The second part of the instrument included items that addressed the role of graduate advisors and department heads in serving as mentors to the students.

Results

After two administrations of the instrument, distance students reported low levels of interaction with their faculty advocates. However, students reported mentoring relationships with others in addition to their assigned faculty advocate. Students indicated that the department chair, the graduate student coordinator, and other faculty had served as mentors to them. When asked if they felt their advocate had fulfilled the needs of the student mentee, one student answered "No, but I have not asked many questions either. I have asked questions of other advisors and they were very helpful." All other students who answered this question indicated that their advisor had met their needs as a mentee.

Conclusions

Students in the distance degree program, while reporting low levels of interaction with their assigned mentor, reported mentoring relationships with other members of the faculty at the cooperating universities and that these relationships were perceived as important to their success.

Implications

Even in the initial stages of their pursuit of a graduate degree, distance students sought out interactions with mentors, both assigned and not-assigned to them individually. As mentors to students, faculty must be cognizant to the importance of these mentoring relationships – both perceived and real. Further research is needed on mentoring at the graduate level for both resident and distance students. In addition, research is warranted on the mentoring received from relationships outside of traditional roles such as graduate committee chairs.

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Research

The Influence of a Professional Development Workshop on Secondary Agriscience Instruction

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Need for Research

Across the United States, professional development workshops are conducted to provide teachers with the latest in content, instructional techniques, and classroom technologies that will facilitate their local efforts to improve their local curriculum and instructional programs. With seemingly limitless workshop opportunities offered through professional organizations (e.g. NAAE) or through education-focused businesses, the capacity to improve secondary instruction is ever present. Yet with these opportunities, little is known of the effectiveness of these workshops to create change in local secondary-level programs. Williams (2009) found that for agriscience teacher workshops to be effective measures, they needed to be confined to one-day or shorter in length as teachers were unlikely to participate if the workshop was any longer. Miller (2006) found that workshops can create a positive attitude towards the topic and intentions to change the local curriculum. However, Williams (2009) also found that intentions to change does not equate to actual change, even if the content is tied to an FFA-related CDE event.

Workshops related to topics like computer technology updates have the potential to impact across the entire local instructional program. However, many agriculture content-related workshops are designed for teaching in a specific course. There are some core content topics like water, energy, labor that have the ability to cross several agriscience course boundaries. As such, workshops related to these topics also have the potential to impact across the entire local instructional program. This study sought to understand the potential for an agriculture-related, content workshop to impact across a local agriscience curriculum.

Theoretical Framework

According to Cervero (1984), the effectiveness of a continuing professional education (CPE) program can be determined by looking at four separate variables instead of just the one variable, the CPE program, as stated in previous research. Those four variables are: characteristics of the CPE program, characteristics of the individual professional, characteristics of the proposed behavioral changes, and characteristics of the social system in which the professional operates. These variables commonly appear in diffusion of innovations literature, which also focuses on behavior change. In this study we will specifically look at the behaviors, attitudes, and characteristics of the individual teaching professional.

Purpose and Objectives

The purpose of this study is to determine the effectiveness of using a workshop to influence knowledge, beliefs, attitudes, and behaviors of agriscience teachers toward the implementation of water-management curriculum into their classroom instruction. The specific objectives guiding this study are to:

1. Describe [state] agriscience teachers through demographic variables: age, completed years teaching, gender, highest degree received, background, water management related experience, current water-related instructional practices, and frequency of water management and conservation information seeking behavior.
2. Determine knowledge, beliefs, attitudes, behaviors, and confidence of Texas agriscience teachers towards the implementation of water related curriculum in their classroom instruction immediately following participation in the workshop.

Methodology

Agricultural educators in [state] were the target population for this study. From the population, those who attended the annual [state] agriscience professional development conference were deemed the sampled population (Lohr, 1999), and the 28 who attended the water management workshop served as the sample for this study. This quantitative study utilized a 75-item questionnaire to examine characteristics of the four variables previously mentioned and to gather demographic data. Items were measured using Likert type scales and true/false questions. At the conclusion of the workshop, teachers were asked to complete the instrument. Appropriate statistical analyses were selected using SPSS 17.0 to answer the research objectives.

Results

The respondents ranged in age from 21 to 58 with the mean age being 40 years. The respondents were 37% female and 63% male. A majority (92.9%) of the respondents were Caucasian. The number of completed years in teaching ranged from zero to 36 (M=11). Bachelor's degree was the most common education level (53.6%) followed by Master's degree (35.7%). For frequency of information seeking regarding water management and conservation, *more than once a year but less than monthly* was the most frequent response (39.3%).

Related to Objective 2 the study revealed that the majority (82%) of secondary agriscience teachers who attended the workshop agree or strongly agree that they are better able to communicate about water management and conservation with others, and they are more likely to include water management and conservation topics in their curriculum. The study also found that 89% of workshop participants felt a workshop is an effective method of increasing water management and conservation knowledge. Over half (64%) of the participants chose agree or strongly agree to the statement *I find teaching water management and conservation to be advantageous in my job*.

Conclusions/implications/recommendations/impact on profession

The study found that upon completion of the workshop almost all participants believed they had gained the knowledge to teach about water management, and they thought a workshop was an appropriate form of gaining that knowledge. All participants said they could teach water management and conservation. Overall, agricultural educators agreed with the statements about changes in their knowledge, beliefs, and attitudes related to water management and conservation.

Based on the findings, a workshop can be a successful means of introducing a new idea to teachers. The results from this study will enhance workshop design and delivery for future teacher conferences.

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Research

Twitter Use Among Texas Agricultural Organizations

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Introduction/Need for Research

Social media websites such as Facebook and Twitter are very popular tools for communication. According to a recent American Farm Bureau Federation survey, among the 92% of young (ages 18-35) farmers and ranchers who use computers, 46% regularly plug in to some form of social media. said the agricultural community can embrace social media as a new way to open lines of communication with growers, distributors, and consumers (Hoffman, 2009). The *National Research Agenda (NRA): Agricultural Education and Communication 2007-2010* (Osborne, n.d.) stated that research is needed to analyze and improve the effectiveness of technologies that communicate agricultural information.

Twitter is one social media website currently being integrated as a communication outlet within the agricultural industry. Those in the agricultural industry are still wondering how effective this networking tool is, and whether or not Twitter is a “passing fad” (AgWired, 2009, ¶ 6). Therefore, the purpose of this study was to determine the prevalence of Twitter use among agricultural organizations in Texas, and to describe their use of this information technology.

Conceptual Framework

The conceptual framework for this research is based on Blog-Mediated Public Relations (BMPR) and Computer Mediated Communications (CMC). The key features of BMPR (blogger credibility, salience of narrative structure, interactivity, and dialogical self) are conducive to initiating and nurturing relationships with publics, which is a desired outcome of any public relations effort. As a result, blogs and social media have emerged as a new venue for public relations in recent years (Yang & Lim, 2009).

CMC is the “process by which people create, exchange, and perceive information using networked telecommunications systems (or non-networked computers) that facilitate encoding, transmitting, and decoding messages” (December, 2009, ¶ 3). Studies of CMC can view this process from a variety of interdisciplinary theoretical perspectives by focusing on some combination of people, technology, processes, or effects (Walther, 1996).

Methodology

This study conducted an environmental scan in order to identify the prevalence of Twitter use among Texas agricultural organizations. An environmental scan involves the acquisition and use of information about events, trends, and relationships in an organization's external environment (Choo & Auster, 1993). The researchers began by compiling a list of Texas agricultural organizations from the Texas Department of Agriculture and the Texas Agricultural Council.

The resulting list contained 67 organizations. The researchers then searched for each organization on Twitter and found that only four were current users of Twitter. The researchers then investigated these four Twitter accounts to obtain the following information: the number of followers, number of users being followed, how often the organizations post "tweets," and what types of information is being provided.

Results/Findings

Results are displayed in Table 1.

Table 1
Texas Agricultural Organizations' Twitter Use Characteristics

Name of Organization	Twitter User Name	Followers	Users being Followed	How Often Information is Updated	Type of Information Disseminated
Texas Corn Producers	TexasCorn	19	16	Bi-monthly	News and Events
Texas Department of Agriculture	TexasDeptofAg	947	122	Daily	Legislative and Blog Information
Texas Farm Bureau	TexasFarmBureau	2,303	1,344	Daily	Legislative and Blog Information
Texas Wildlife Association	texaswildlife	965	5	Bi-monthly	News and Legislative Information

Conclusions

Of Texas agricultural organizations, 94% are not currently users of Twitter. The four organizations that have Twitter accounts use this form of social media to relay information about the organization, upcoming events, legislative information, and news on their blogs. Except for the Texas Wildlife Association, there seems to be a similarity between the number of followers and the number of users that the organization is following. Also, the organizations that have a higher number of users also update their information more frequently.

Implications/Recommendations/Impact on Profession

It appears that although social media is being utilized more regularly among those in agriculture (Hoffman, 2009), very few agricultural organizations in Texas have adopted this communication technology. Those that do use Twitter are posting information regarding their organizations and issues of interest to their audience. Organizations that adopt Twitter should provide frequent posts so their followers receive useful information on a timely basis. These organizations should also follow other users on Twitter to increase their number of followers.

Additional research is needed to continue to explore the use of Twitter among agricultural organizations nationwide. It would also be insightful to interview individuals who are representing these organizations on Twitter to determine why they view it as a worthwhile communication channel. Research is also needed with audience members who are following these organizations to determine why they use Twitter and what types of information they prefer to receive from the agricultural organizations they follow.

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Research

Youth-Adult Partnerships – Get your 50/50

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Introduction / Theoretical Framework

Youth serving organizations are not only interested in getting youth participation in their organizations, they are also concerned with how to get youth active within the organization. Some youth serving organizations are giving youth an opportunity to have a voice and voting right on the youth serving organizations board. The logic for engaging youth as partners in collective decision making and action has been articulated as both an issue of social justice and as a matter of good practice, most recently by the United Nations Convention on the Rights of the Child (Zeldin & Petrokubi, 2006). “The shift is toward partnership and connection, toward positive youth development and youth voice and responsibility” (Noam & Fiore, 2004, pg. 1). Within youth development theoretical frameworks, this paradigm shift is referenced as a Youth-Adult Partnership.

Young people want to be involved in the decisions that affect them in everyday life just as adults are involved with the decisions that affect them. This desire to be a part of the decision-making process benefits both youth, adults, boards, and even communities in positive ways. “When adults in young people’s lives hold similar positive values, make these values explicit, and intentionally seek to promote them, they provide a solid guiding influence that helps youth navigate through their social worlds and internalize positive values” (Scales, Leffert & Lerner, 1999, pg. 171). The positive values youth gain while being in a youth adult partnership will in return affect a community or a board.

Numerous youth serving organizational boards utilize youth adult partnerships. One example of a youth serving organization that has taken a strong role in youth adult partnership movement has been the National 4-H. To continue this momentum within the organization, it is imperative that youth-adult partnership research continues. Calvert, Zeldin and Weisenbach stated, “Research is needed to examine the impact of young people on individual adults, both the direct effects of youth action and indirect effects such as changing adult perceptions and expectations of young people” (2002, pg 8). “Researchers can support practice and advance knowledge by documenting the outcomes youth, adult, organizational, community that emanate from different types of youth-adult relationships and partnerships” (Zeldin, Larson, Camino & O’Conner, 2005, pg. 8).

Purpose and Objectives

The purpose of this study was to determine the effectiveness of youth-adult partnerships with state 4-H Foundation boards by assessing perceptions of youth and adult members toward one another. Specific objectives included:

1. Determine selected demographic variables for both youth and adult respondents.

2. Determine if statistically significant differences existed between perceptions of youth and adults serving on state 4-H Foundation boards related to group involvement, interaction and respect.

Methodology

The target population included state 4-H Foundation boards incorporating both youth and adults in formal decision making. The purposive study sample was state 4-H Foundation boards from the Western 4-H region with youth and adults in formal decision-making roles. Foundation boards that met the criteria for inclusion in the sample included those from Hawaii, Montana, Oregon and Wyoming.

Both youth and adult board members were asked to complete the researcher-modified *Involvement and Interaction Rating Scale* (IIRS) developed by Kenneth R. Jones (Jones, 2006). The IIRS had three sections of semantic differential questions: 1) Youth Involvement Indicators; 2) Adult Involvement Indicators; and 3) Youth-Adult Interaction Indicators. The IIRS instrument reliability was reported at 0.94 alpha (Jones & Perkins, 2005). An example semantic differential question was "Youth appear uneasy and intimidated by adults" opposed to "Youth seem comfortable working with adults". The researchers used SPSS to analyze data.

Results/Findings

The response rate for this study was 77.8% (7/9) youth and 54.2% (39/72) adults; with an overall response rate of 56.8% (46/81). Female youth accounted for 71.4% (n=5) of youth respondents; males made up 28.6% (n=2). Female adults accounted for 53.8% (n=21) of adult respondents; males made up 46.2% (n=18). The respondents' ethnicity included 19.6% (n=9) Asian and 80.4% (n=37) White/European-American. The majority of respondents 58.7% (n=27) reported living in a Rural/Farm area; 21.7% (n=10) reported Suburban, and 19.6% (n=9) indicated Urban/City.

To the question, "Is this your first time participating in a setting that involves youth and adults working together?", 57.1% of youth responded no, and 76.9% of adults responded no. Respondents who answered no were asked to list other youth-adult partnership settings in which they had worked. Youth listed county 4-H programs, Business Professionals of America, Key Club, Boy Scouts, and High School Rodeo. Examples listed by adults included FFA Foundation boards, church, Boy and Girl Scouts, teenage parenting education, and community projects.

The independent t-test analysis of the semantic differential questions revealed only one question that returned statistically significant differences between youth and adult responses. Upon comparison, the statements, *Adults command youth to follow the directions of adults* contrasted with *Adults encourage youth to come up with their own ideas,* were ranked lower ($p = 0.018$) by the youth than the adults.

Conclusions

Based on data analysis, it was apparent that youth and adults serving on 4-H Foundation Boards in the 4-H Western Region lacked the levels of ethnic diversity corresponding with the states' populations. It was also apparent that gender representation, especially among youth serving on these boards was unequal. The majority of youth and adults had experienced working within a youth-adult partnership for decision-making in settings besides the 4-H organization. The researchers concluded that, while differences between youth and adult perceptions and values existed, both groups were more in agreement than disagreement about the value of the youth-adult partnerships.

Implications, Recommendations & Impact on the Profession

Western Region 4-H Foundation boards should broaden the selection criteria in order to diversify. Additional research due to expanded ethnic and gender diversity is needed. Due to lack of equal representation, the researchers question whether board effectiveness and youth-adult partnerships would be impacted by equal representation between youth and adults. Additional research comparing different types of youth-adult partnership boards (4-H and others) will strengthen the theoretical framework. Research is also needed to determine the impacts of member training on Youth-Adult Partnerships.

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Appendices

2010 Western AAAE Research Paper Call

Research Session Chair and Facilitator Responsibilities

2010 AAAE Western Region
Research Conference
April 21-23, 2010
Great Falls, MT

CALL FOR RESEARCH PAPERS

Manuscripts that describe completed research not previously reported at any AAAE Regional Agricultural Education Research Conference or the National Agricultural Education Research Conference will be considered for acceptance. Manuscripts must be authored or co-authored by AAAE members affiliated with the Western Region.

Paper Format:

- All manuscripts to be considered for presentation must be submitted for blind review, thus, do not place your name or other identifying information on or within your paper;
- Suggested manuscript sections: Abstract, Introduction-Theoretical Framework, Purpose and Objective(s), Methods and Procedures, Findings, Conclusions-Implications-Recommendations, References;
- 12-page maximum, including abstract, tables, figures. References are not counted in the 12 page limit;
- 12 point Times Roman or Times New Roman font, MS Word format only;
- All margins – 1 inch;
- Single space the manuscript, double space between paragraphs and between headings and text;
- Manuscript title should be centered with the initial letters in caps;
- Abstract (200 word maximum) should follow the manuscript title;
- The Introduction-Theoretical Framework should immediately follow the Abstract;
- All tables and figures are to be placed within the body of the manuscript as soon after being identified in the text as possible;
- Table functions command must be used for all tables;
- DO NOT use headers, footers, and footnotes;
- Number each page beginning with first page at bottom center;
- A cover page is not needed with the *FastTrack* manuscript submission and review system.

Style: APA **6th** Edition (**note the change**)

What to Submit (all submissions and the "blind" review process will be completed electronically):

- Electronic file (Microsoft Word) of complete manuscript
- Submit via *FastTrack* at http://aaae.expressacademic.org/login.php
  - **If you are not registered, you will need to create an account first!**
  - In the *FastTrack* submission process, be sure to include:
    - Notes Section: Indicate which authors are in the Western Region
    - Title: Provide complete manuscript title
    - Author(s): List additional authors on manuscript besides the lead author
    - Document Type: – Western Region: Quantitative, Qualitative, Historical, or Philosophical
    - Topics: Indicate which National Research Agenda topic or topics to which the manuscript most closely relates
    - Attached the manuscript and click "Add Submission"

Deadline: Monday, January 11, 2010

Questions: Contact Carl Igo cigo@montana.edu; Shannon Arnold, shannon.arnold@montana.edu; or Marty Frick, mfrick@montana.edu (406.994.2132)

Chairperson's Responsibilities

1. The Session Chair acts as the "Master of Ceremonies" for each session
2. Arrive at the meeting room 15 minutes prior to the starting time of the session
3. Secure biographical information for each speaker in order to make appropriate introductions.
4. Introduce yourself and the facilitator.
5. Introduce each presenter before they begin their presentation. Introductions should be kept short in order to allow the maximum amount of time for the presentations.
6. Start the meeting on time and adhere to the schedule of presentations. The facilitator will keep time for the presentations. Each paper presentation is allotted 15 minutes with 20 minutes of discussion time to begin after the final presentation.
7. Consult with the Facilitator prior to the start of the session to coordinate time keeping. Time cards will be available for use by the Facilitator.
8. After the final presentation, invite all of the presenters to take a seat in the front of the room. It will be your responsibility lead the discussion. You are not expected to prepare a written critique and comment on each paper, but you may need to get the discussion going.
9. Keep the discussion on schedule and allow time for an appropriate closing of the session.
10. Conclude the session by thanking the Presenters and Facilitator.

Facilitator's Responsibilities

1. Report to room 15 minutes before your session begins.
2. Introduce yourself to the Session Chairperson when you arrive. Check to be sure there is a laptop computer, screen and projector in your room. If not, be sure to contact Eric Larsen (406-460-0245) immediately.
3. You are responsible for keeping track of time for the presenter. You will be provided with a stopwatch and time cards to alert the presenter as to how much time they have to complete their presentation. Paper presenters have 15 minutes to present.
4. Stand at the door to the room. When the session is about to begin, close the door. The session chair will introduce him/herself and the facilitator.
5. You are to turn down the lights as requested by the presenter. Most of the presentations will be by PowerPoint®.
6. Start the stopwatch when the presenter begins her/his presentation. When there is five minutes left, hold up the "5 min." card to the presenter. Wait until he/she acknowledges seeing it. Repeat at "3 min." and "1 min." mark. Hold up the "Stop" sign when time is up. If the presenter stops before time has expired, you do not need to hold up the signs.
7. After the final presentation, the presenters will be invited to take a seat in the front of the room. Please assist in having chairs set up (wait until the final presentation is completed). Set the watch for 20 minutes for questions. At the end of 20 minutes, call "Time."
8. Turn the lights back up in the room.
9. Be sure to hold on to the watch and cards until the end of the session and place back in the Facilitator Folder.
10. Each room will be used twice. Make sure all equipment and Facilitator Folder are in the room before you leave.
11. At the completion of the third round of presentations, please stay in the room to assist with the removal of the AV equipment. Before turning off or disconnecting the equipment, check with Eric Larsen.