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the professional journal advancing the scholarship of teaching and learning in agricultural, environmental, natural and life sciences

Contents

Are there Differences in Academic and Social Integration of College of Agriculture Master's Students in Campus Based, Online and Mixed Programs?[1]

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Abstract

To investigate differences in student's academic and social integration between campus based and online programs, College of Agriculture Masters students in U.S. campus and online degree programs were surveyed. To investigate potential influences of differences, College of Agriculture graduate program directors were surveyed. Data were gathered using online questionnaires. The student questionnaire included demographics and three scales, academic integration, social integration and intention to persist. Academic integration was measured with the subscales of advisor relationship and academic interaction. Social integration was measured with the subscales of peer group support, faculty interactions and involvement in social interactions. The director questionnaire included five variables designed to measure attitudes and design of online programs. Descriptive statistics, ANOVA, Mann-Whitney U and Tukey's HSD were conducted to identify program differences and to identify attitude and program format differences. Significant differences were found between online and campus students on academic and social integration scales, but not on the intention to persist scale; and on graduate director attitudes and types of communication used in the graduate online programs. This study indicates that there are differences in integration of campus and online students. Strategies to improve online student's socialization may include communication components designed to increase meaningful interactions.

Introduction

In recent years, there has been a great increase in online learning. In 2006-2007, the National Center for Education Statistics reported that 66% of 2-year and 4-year institutions offered college-level distance education courses (U.S Department of Education, 2009). In 2012 that number grew to 86.6% (Allen and Seaman, 2013). There were also an estimated 20 million students enrolled in these distance education courses, out of which 6 million are taking at least one online course (Allen and Seaman, 2013). These courses have allowed many students to pursue educational degrees without being limited by their distance to a university (Card and Horton, 2000).

Many sources report higher dropout rates for online courses and programs as compared to traditional campus based courses and programs (Carr, 2000; Diaz, 2000). Carr (2000) for example, found student persistence in campus based programs was 10-20% higher than in distance programs, though there was a lot of variation in this persistence between institutions, with some reporting rates of 80% completion and others reporting less than 50% completion. Parker (1995, 1999) also found that some first attempts at adapting courses for distance learning had high dropout rates of 70-80%, and even many established programs expect a higher dropout rate than a corresponding campus course, at the rate of 11-15% (Bos and Shami, 2006). Thus, retention in online degree programs and courses is a challenge of many universities today.

Patterson and McFadden (2009) looked at completion rates of students in two online graduate degree programs as compared to the campus-based delivery format of the same two programs. The online and campus-based programs were mostly identical; they were based in the same departments and used the same professors, curriculum, assignments, technologies and support services to control for intervening variables. The study found that the two campus-based programs had drop-out rates of 11% and 4%. In contrast, the

online programs had drop-out rates of 43% and 23.5% respectively (Patterson and McFadden, 2009). Also, there was no significant relationship found between students' GPA or admission test score and dropout.

What other factors, then, is influencing retention in online programs? Rieger (2002) suggested the abundance of hands-on-learning and visual content in agriculture programs may not transfer well to distance education. The online environment can provide a more diverse group of students from a wide array of locations and with different backgrounds (Cassiani, 2001). This can contribute to a lack of interaction, and this lack of interaction, along with a deficiency of hands-on experience, may make students feel isolated (Paul and Brindley, 1996). Compounding this problem is the fact that one study found that though in some courses students created a supportive and interactive environment with their teachers and other students, the environment lasted only through that particular class, or in some cases, particular activity (Ivankova and Stick, 2007). This lack of interaction may be problematic as Tinto (1993) suggests that interactions between students and faculty at a university shape student's development through socialization, which, ultimately, affects their persistence at a university.

Gardner (2008) defines socialization as the process through which students learn how to behave and what it means to succeed or fail. Eaton and Bean (1993) theorized that, "*Social and academic integration can be considered to be primary indicators of adjustment to the college environment*" (p. 9). Socialization, then, can be described by two different constructs, academic integration and social integration. Social integration involves interpersonal relationships, support, interactions with others and a sense of belonging at a university (Spady, 1970; Tinto, 1975). Social integration stems from extracurricular activities, informal dealings with student's peer group and interactions with faculty and staff (Tinto, 1975). When these activities are successful, they will help a student develop friendships, support, affiliation and channels of communication (Tinto, 1975). Academic integration is explained by grade performance and intellectual development. Grade performance reflects an ability to meet the standards of the academic system; intellectual development involves a student valuing their education as a process of development in which they gained knowledge and ideas (Tinto, 1975). Academic integration is key because it involves students becoming integrated into the system that will allow them to achieve their goal of becoming professionals in their disciplines (Lovitts, 1996).

These theories provide a basis for which to examine graduate student persistence. Tinto (1993) suggests that research done on graduate student persistence will yield similar findings as those done on undergraduate students. However, there are differences to be considered when examining graduate education as opposed to undergraduate education. First it is more likely that the pattern of persistence will be more similar among the same field of study across institutions than among different fields at the same university (Zwick, 1991). Additionally students' social interactions with both peers and faculty are closely linked with students' intellectual development, as well as the development of the skills and knowledge necessary to complete the degree. Social membership in a program becomes part of a student's academic membership in the program and, ultimately, in the student's field (Tinto, 1993). The second difference in graduate education is the goal of socialization. According to Baird (1992) and Rosen and Bates (1967), the goal of graduate student socialization is to take a raw scholar and turn them into an academic professional. Finally, unlike with undergraduate students, the affect that the community has on the graduate student changes over time (Tinto, 1993). For example, Tinto (1993) mentioned that persistence in the later part of the degree, which involves research, is likely to be influenced by a single faculty member or a small group of faculty members. This is not so much the case in the beginning stages of a doctoral student's degree.

As discussed above, relationships between students and their advisors, committees and peers influence the process of socialization, integration and ultimately students' persistence in their degree programs. Thus, our research question is: does the online environment effect student's persistence to complete?

The objective of this study was to explore factors relating to academic and social integration. Specifically, are there differences in student's academic and social integration between campus based and online programs in the College of Agriculture and do these differences affect student's persistence? Also, is integration a factor that is being considered when designing an online course or program and if so, what steps are taken in the design of the course or program to increase integration?

Materials and Methods
Sample

The study population was students and graduate program directors from Colleges of Agriculture with campus based and online Master's degree programs. The student sample was drawn from equivalent campus based and online programs that had similar requirements, professors and structure. We began by identifying U.S. universities that had both online and campus based agriculture programs. The programs were found through online searches of university webpages. Seven universities containing relevant programs were identified, University of Nebraska, Texas Tech, Virginia Tech, Iowa State, North Carolina State, Texas A & M and Washington State. From these universities, 16 online and campus programs were identified. These programs included agronomy, horticulture, agriculture, plant breeding and pest management degrees. Invitations to participate resulted in all but Texas A & M agreeing to participate.

The graduate program director sample was drawn from graduate directors of online College of Agriculture Master's degree programs. The sample came from various U.S colleges that had online College of Agriculture graduate programs that were identified through online searches of university web sites.

Instrumentation
Overall Measurement of Integration

To collect the data a questionnaire instrument was used. Questions were adapted from instruments from Sorokosh (2004), Little (2009), Cardenas (2005) and Donatelli (2010) which had reported Cronbach's alpha reliability ranging from 0.81 to 0.96. Cronbach's alpha is a measure of internal consistency for a set of related items. A reliability coefficient of .70 or higher is considered acceptable in most social science research situations. A six point Likert type scale of agreement or a six point scale asking "how often have you done the following interactions" were used.

The first subscale contained questions on student's academic integration. The two variables included in measuring academic integration were advisor relationship and academic interactions. The scores of the two variables were combined to create an average academic integration score. The advisor relationship variable consisted of eight questions. The first, do you have an advisor consisted of a yes or no response. The remainder of the questions measured the quality of the relationship between the student and their advisor. These included questions such as: "my advisor advises me effectively" and "my relationship with my advisor has had a positive influence on my intellectual growth." The participation in academic interactions variable contained seven questions designed to measure the frequency students participated in academically focused interactions with others. The questions were adapted from Cardenas' (2005) questionnaire designed to measure doctoral student involvement. Some of the interactions asked about were "attended professional conferences or meetings" and "attended research seminars in yours or others disciplines." The responses were based on a six point scale, asking how often they have done various interactions.

The second subscale measured social integration by three variables; peer group support, interactions with faculty and involvement in social interactions. The sums of the three variables were combined to create a social integration score. The peer support variable contained 11 questions designed to measure the strength and usefulness of student's support from their peers. The variable included questions like "since starting this program I have developed close personal relationships with other students" and "few of the students I know would be willing to listen to me and help me if I had a personal problem." The responses were based on a six point Likert type scale measuring extent of agreement with each statement. The faculty support variable contained 11 questions designed to measure

the opportunities and ease students had interacting with faculty members as well as the impacts these interactions had on students. Students were asked to rate, on a six point Likert type scale, the extent to which they agreed with statements. Some statements were "I am satisfied with the opportunities to meet and interact informally with faculty members" and "faculty are very accessible." The final variable was involvement in social interactions. This variable contained 6 questions designed to measure student's involvement in informal social interactions. Some interactions asked about were "attended informal dinners and get-togethers with other fellow students" and "met with students to talk about course work, plans of work and faculty." The responses were based on a six point scale, asking how often they have done various interactions.

Intention to Persist Instrument

Several studies have found a link between intention to persist and student's actual persistence (Bean, 1982, Bean, 1990; Faghihi and Ethington, 1996). Therefore a scale measuring intent to persist was included in this instrument. The scale consisted of five questions and responses were based on a six point Likert type scale of agreement. Some questions included were "I am confident I made the right decision to enroll in this program" and "I am sure that I will complete this degree program."

Graduate Director Instrument

For this part of the study a questionnaire was used to collect data. The questionnaire contained five variables. The first variable measured the extent to which they agreed that interactions and relationships between themselves and students and between students and each other are important. Interaction was defined as "the activity of being with and talking to other people and the way that people react to each other" ("Interaction," 2013). As mentioned above, many studies (Gardner, 2007; Tinto, 1975; Spady, 1970) support that interaction between students and faculty is important in developing academic and social integration. Relationship was defined as "the way in which two or more people talk to, behave toward and deal with each other" ("Relate," 2013).

The second variable measured the format and design of the online program overall or in the individual courses of the program. Included were questions about face to face interaction, asynchronous text communication, online collaborative sharing, synchronous video communication, synchronous text communication and the use of social networking sites. They were asked whether these format components were used "at the programmatic level", which was defined as *"Components used within the graduate program as a whole, targeted to all students in the program regardless of the individual courses they may be enrolled in;" "used in a program course,"* which was defined as *"Components used by instructors within and for their individual courses, tar-*

geted to students enrolled in a specific course" or "used both at programmatic and course level."

The third variable measured whether or not these components were specifically planned within the course with the purpose of encouraging interaction between students and their peers or between themselves and their students. Graduate directors were again asked whether the components were used "at the programmatic level", "used in a program course" or "used both at programmatic and course level."

The next two questions asked graduate directors to rate which of the above components they felt were effective at achieving interaction and discussion between themselves and their students or between students and each other at both the program and course level. The graduate directors were asked to rank the components they felt were effective with a one being the most effective component and six least effective.

Finally, the fifth variable measured the frequency the components were used. They were asked to rate, on a scale of 1-5 how often they used each of the components at both the program and course level; with a 1 indicating daily or every other day usage, 2 indicating weekly, 3 indicating two to three times a month, 4 once a month and five less than once a month.

Data Collection
Student Survey

The instrument was pilot tested using Axio Survey (Axio Learning, 1.0, Manhattan, KS). M.S. students in the Kansas State University Horticulture department received an e-mail asking for their participation. The e-mail included a link that took them to the questionnaire. Once they clicked on the link in the email they were taken to the beginning of the questionnaire. There they saw a statement with privacy information and were asked if they consented to be included in the pilot test for the study. They were then taken to the remainder of the questionnaire. After the data were collected Cronbach's reliability coefficients were calculated and a correlational matrix was constructed. Because the Cronbach's alpha's were all above 0.70 no questions were removed. Also, no patterns indicating the scales were measuring different constructs were identified.

The national survey was offered online through Axio Survey. E-mails were sent out to the graduate directors of the programs identified. In some cases the same person was the director of both the online and campus based program at the university; otherwise the e-mail was sent to both the campus and online graduate director. The e-mail included some information about the study and a request to forward a message and survey link to all the Master's degree graduate students that were currently enrolled in their program(s). The e-mail also included a request for the graduate directors to respond as to whether or not they forwarded the message to their students and an e-mail address to contact if they had any questions. The message for the students and the link to the online survey was included in the bottom of

the e-mail to the graduate directors. The message to the students also included some information about the study, a request for their participation, an incentive and a link to the online questionnaire.

One follow up e-mail was sent to the graduate directors with the same information and request for them to forward a message to all the students enrolled in their program. The message to the students included a reminder request, information about the incentive and a link to the online survey. Both the original and follow up e-mail were sent in the same semester.

As mentioned above, students received the invitation to participate in the survey through their graduate director. Included in the email was a link to the online survey. Once students clicked on the link in the email they were taken to the beginning of the questionnaire with a statement of privacy information and were asked if they consented to be included in the study. Students were then taken to the remainder of the questionnaire. The questionnaire was completely anonymous. After the end of the questionnaire students were given the option to provide an e-mail address which would be used to send them their incentive. A total of 54 Master's students responded, and of these 42 were usable. There was representation across all six universities included in the study. Program directors were asked to provide the total number of students they sent the survey e-mail request to. This number was not provided from all programs so a response rate cannot be calculated.

Graduate Director Survey

We began by identifying U.S. universities that had online College of Agriculture Master's degree programs. These programs were identified using online university and departmental websites. Programs at 15 universities were identified, the types of programs included agriculture, agricultural education, agroecology, agronomy, crop science, horticulture, pest management, plant breeding and turfgrass management.

The survey was offered online through Axio Survey. Once programs were identified, e-mails were sent out to the graduate directors of the programs (n=15) that included some information about the study and a link to the survey.

One follow up e-mail was sent to the graduate directors with the same information and request for participation. Both the original and follow up e-mail were sent in the same semester.

Once graduate directors clicked on the link in the email they were taken to the beginning of the questionnaire with a statement with privacy information and were asked if they consented to be included in the study. Directors were then taken to the remainder of the questionnaire. The questionnaire was completely anonymous. Fifteen graduate directors were invited to participate, 12 did, for a response rate of 80%.

Are there Differences in Academic

Data Analysis
Student Data

Data was downloaded into Microsoft Excel (Microsoft, 2010, Redmond, Washington) and analyzed using Minitab (Minitab, Inc, 16, State College, PA). Answers were coded 1 (strongly disagree) to 6 (strongly agree). Data analysis conducted to examine the difference between online, mixed and campus based graduate students on the academic and social integration scales, subscales and the intention to persist scale included ANOVA and Tukey's HSD, to determine if there was a significant difference between campus based and online students on any of the measures.

There was a difference in the subscale of academic interactions between how students were answering two of the seven questions (ANOVA). There were two different sub-constructs within the academic interactions construct. Thus the academic interactions construct was broken into two groups, research interactions and non-research academic interactions. Research interactions included questions such as "Met with fellow students to talk about your research" and "Attended research seminars in yours or others disciplines." Non-research interactions included questions such as "Met outside of class with other students in your program for a meeting, discussion, or study group" and "Participated in departmental colloquium or brown bags."

Graduate Director Data

Descriptive statistics were run to assess the percentage of directors who answered each category to determine what percentage either "agreed" or "disagreed" that interaction and relationships, either between themselves/instructors and students or between students were important.

Because of the ordinal nature of the data, a Mann-Whitney U Test was run between the two questions involving interactions and relationships between students and the two questions involving interactions between themselves/instructors and students in an online graduate degree program. The importance of the interactions and relationships was the dependent variable with the groups of student to student interactions/relationships and director/instructor to student interactions/relationships being the independent variables. This was done to test whether the importance assigned to these types of interactions and relationships was the same for both groups.

A Tukey's HSD was run on the responses from the question of "Please indicate … how often these components are used at the programmatic level" to determine if there was a difference between how often each of the components were used at the program level in the online agriculture programs. The components included face to face interaction, asynchronous text communication, online collaborative sharing, synchronous video communication, synchronous text communication and the use of social networking sites. A Tukey's HSD was also run on the responses from the question of "Please indicate … how often these components are used at the program course level" to determine if there was a difference between how often each of the components were used at the program course level in the online agriculture programs.

Results and Discussion
Student Survey
Demographics

Thirty-seven percent of the respondents were thesis-option students and 62% were non-thesis. Campus based respondents made up 48.8% of the sample, online 34.1% and mixed campus/online 17.1%. On average (72.5%) they had been enrolled between two and five semesters. Sixty-two percent indicated that they were full time, 37.5% were part time and 55% were on an assistantship. Including the work they may do for their assistantship, 20% of students worked between 1-20 hours a week, 25% between 20 and 40 hours a week and 47.5% indicated that they worked more than 40 hours a week. Fifty-four percent of the students also indicated that the time needed for them to graduate was about what they expected, while 41.5% indicated that it was more than they expected. Finally, out of the sample most (80%) answered that they were White/Caucasian, 61% were female and 39% were male.

Respondents who were campus based students tended to work between 1 and 40 hours a week ($\chi 2 = 20.88$, n=31, p=0.001), be in a thesis program ($\chi 2 = 4.47$, n=31, p=0.03), be a full time student ($\chi 2 = 10.61$, n=31, p=0.001) and have an assistantship ($\chi 2 = 13.78$, n=31, p=0.001). On the other hand online students tended to work more than 40 hours a week ($\chi 2 = 20.88$, n=31, p=0.001), not be in a thesis program ($\chi 2 = 4.47$, n=31, p=0.03), be a part time student ($\chi 2 = 10.61$, n=31, p=0.001) and not have an assistantship ($\chi 2 = 13.78$, n=31, p=0.001).

Academic and Social Integration

There were significant differences in the mean scores between online, campus based and mixed program students for academic integration and social integration (Table 1). Students who were in campus based and mixed programs scored higher on academic integration than those in the online program, and students in the campus based programs scored higher on social integration. The student's intention to persist did not differ across the program types and overall, the student's indicated a high intention to persist.

To further understand the effects of academic integration and social integration on intention to persist, the constructs for each factor were also analyzed. Within academic integration, research interactions was significantly different across program types with students in online programs having the lowest score (Table 2). There were no differences between program type in mean score for advisor relationship or non-research interactions.

Table 1. Mean scores[z,y], standard deviations and ANOVA for academic integration scores, social integration scores and intention to persist scores by program type.

Program Type		Academic Integration	Social Integration	Intention to Persist
Campus Based	Mean	3.55a[x]	4.22a	5.06
	SD	0.86	0.82	0.71
Online	Mean	2.55b	3.16b	5.07
	SD	1.07	0.79	0.89
Mixed	Mean	3.66a	3.61ab	5.49
	SD	0.58	0.72	0.76
	F	5.98	7.41	0.83
	P-Value	0.005**	0.002**	0.44

** Denotes significance at p=0.01 using ANOVA

[z] n = 42

[y] range of scores are 1 (low) to 6 (high)

[x] Mean separation in rows by Tukey's HSD, *P= 0.01*

Table 2. Mean scores[z,y], standard deviations and ANOVA for academic integration subscale scores for advisor relationship, research interactions and non-research interactions.

Program Type		Advisor Relationship	Research Interactions	Non-Research Interactions
Campus Based	Mean	4.37	3.13a[x]	2.56
	SD	1.81	0.84	0.56
Online	Mean	5.29	1.54b	2.11
	SD	0.40	0.80	0.87
Mixed	Mean	4.99	2.36ab	2.54
	SD	1.37	0.95	0.71
	F	0.98	14.68	1.87
	P-Value	0.39	0.001***	0.168

*** Denotes significance at p=0.001 using ANOVA

[z] n = 42

[y] range of scores are 1 (low) to 6 (high)

[x] Mean separation in rows by Tukey's HSD, *P= 0.01*

Table 3 Mean scores[z,y], standard deviations and ANOVA for social integration subscale scores for peer-group support, interactions with faculty and social interactions.

Program Type		Peer-Group Support	Interactions with Faculty	Social Interactions
Campus Based	Mean	4.36a[x]	4.72	3.07a
	SD	0.81	1.18	1.03
Online	Mean	3.24b	4.02	1.30b
	SD	1.20	1.14	0.48
Mixed	Mean	3.85ab	4.14	2.19ab
	SD	0.92	1.05	0.86
	F	5.45	1.75	17.89
	P-Value	0.008**	0.188	0.001***

, * Denotes significance at p=0.01 or 0.001, respectively using ANOVA

[z] n = 42

[y] range of scores are 1 (low) to 6 (high)

[x] Mean separation in rows by Tukey's HSD, *P= 0.01*

As mentioned above, involvement in research interactions mean scores were different between program types. Within social integration, involvement in social interactions mean scores were also significantly different between the program types (Table 3). This construct dealt with interactions that did not have an academic component such as departmental socials, student get-togethers, or informally meeting with and talking to other students or faculty members.

These differences in involvement in both types of interactions is perhaps not surprising considering that most online students live some distance away from both other students and from the campus where the program is offered. Though the survey asked students to consider both online and face-to-face interactions, it is in some ways not as convenient or easy to be involved in these types of interactions when living at a distance.

For example, distance students do not "see" the other students in the hallway and they cannot physically drop by their offices or the offices of other faculty or staff members or walk to a departmental seminar.

However, participation in interactions, whether social or academic in nature were not the only constructs that were different. Within social integration, a difference in peer group support was also seen (Table 3). Specifically the mean rating for peer group support was lower in the online students than in the campus based students. Considering the lower amount of interactions, this is perhaps not surprising and also perhaps a bit alarming. As mentioned above, social integration involves interpersonal relationships and support (Spady, 1970; Tinto, 1975); and stems from interactions with students peer group, faculty and staff (Tinto, 1975). Also as mentioned above, the diversity of backgrounds and locations that can be present in an online environment may contribute to a lack of interaction and a sense of isolation (Paul and Brindley, 1996).

Perhaps what is most interesting from this survey, were the students in the mixed program. These students had similar academic integration, social integration, peer-group support and social interactions as the campus based students (Tables 1-3). While we do not know how much of the program was online and how much was on campus, these findings suggest that investigating this further to identify just how much of a program needs to be on campus to promote socialization would be useful. Additionally, while there were some differences between the students in the three program types, there were no differences in their intention to persist. Given the statistics on the drop-out rates for students in online programs and courses, this may indicate that the tide has turned, such that our understanding of online teaching and learning is resulting in better learning environments for online students.

Graduate Director Survey
Online Graduate Relationships

Graduate directors of online programs showed a statistically significant difference between the importance assigned to student to student interactions and relationships and director/instructor to student interactions and relationships (Table 4). It can be further concluded that the director/instructor to student relationships were ranked as more important than student to student relationships in an online graduate program (Table 4). This difference may help explain why student interactions with faculty and advisor relationship were not significantly different across program type (Table 2, 3); it is possible that the online programs are designed to insure these interactions occur. This difference may also help explain why differences were seen in both involvement in social interactions and peer group support. If gradu-

ate directors do not consider student to student interactions as important, online programs may not be deliberately designed to incorporate as many interactions between students. This, in turn, could inhibit the development of social presence because peer-to-peer interaction in online environments stimulates and is stimulated by social presence (Moore and Kearsley, 2004). This in turn could affect the support student's feel from their peers because when students participate in interaction, project their identities and feel others presence they become bound together (Gunawardena and Zittle, 1997).

Types of Communication

The program directors were also asked about the use of many methods used today to foster online interaction and communications. Asynchronous text communication and online collaborative sharing were used significantly more often than synchronous video communication and face to face interaction at the programmatic level in an online graduate degree program (Table 5). There was no significant difference in the amount that asynchronous text communication, online collaborative sharing, synchronous text communication and social networking sites were used at the program level.

Asynchronous text communication was used significantly more often than synchronous video communication, synchronous text communication and face to face interaction at the program course level (Table 6). There was no significant difference in the amount that asynchronous text communication, online collaborative sharing and social networking sites were used, at the course level. These results indicate that more communication components are used more often at the programmatic level than the course level. Also at the programmatic and course levels, face-to-face interaction and synchronous video communication methods of communication which allow the people communicating to see others faces and body language, were the least used.

If we consider the idea of social presence – the sense that other people are "real" and the sense of "being together with others" outside of the students immediate environment (Lehman and Simone, 2010) – then the information that synchronous and face-to-face interactions are less used than asynchronous types of communication is important. For one, the process of communicating emotions and feelings is important in communication. Tu and McIsaac (2010) found that in an online environment, plain text may be lacking in stimulation and students find it harder to express the meanings and emotions that they intend and therefore are concerned about misunderstanding others and about other students misunderstanding them. Also response time is crucial in online interaction, So and Brush (2008) found that students reacted negatively to the absence of synchronicity especially as related to the lack of immediate feedback. Tu and McIsaac (2010) also found that if a student did not respond in the time expected or did not respond at all, the sender felt less social presence. Thus So and Brush (2008) suggest two-way synchronous communication and or visual

Table 4. Mann-Whitney U test[z] comparing mean rank responses among Student to Student interaction and relationship and Graduate Director/Instructor to Student interaction and relationship questions.

	Group	N	Sum of Ranks
Importance of Interactions and Relationships	Student to Student Interactions and Relationships	24	420
	Director/Instructor to Student Interactions and Relationships	24	756
	Total	48	1176***

*** Denotes significance at p=0.001 using Mann-Whitney U test

[z] z = -3.45

Table 5. Differences between mean responses (Tukey's HSD[z,y]) on how often these components were used at the program level.

	Asynchronous Text Communication	Online Collaborative Sharing	Other	Synchronous Text Communication	Social Networking Site	Synchronous Video Communication
Online Collaborative Sharing	1.28					
Other Choice	0.73	0.00				
Synchronous Text Communication	2.36	1.09	0.64			
Social Networking Site	2.77	1.49	0.88	0.39		
Synchronous Video Communication	4.80**	3.48**	2.04	2.32	1.94	
Face-to-face Interaction	4.96**	3.68**	2.21	2.56	2.18	0.31

** Denotes significance at p=0.01 using Tukey's HSD

[z] n = 12

[y] Critical Value 3.07

Table 6. Differences between mean responses (Tukey's HSD[z,y]) on how often these components were used at the program course level.

	Other Choice	Asynchronous Text Communication	Online Collaborative Sharing	Social Networking Site	Synchronous Text Communication	Synchronous Video Communication
Other Choice						
Asynchronous Text Communication	0.39					
Online Collaborative Sharing	1.52	2.74				
Social Networking Site	1.59	2.84	0.17			
Synchronous Text Communication	2.09	3.91*	1.31	1.12		
Synchronous Video Communication	2.37	4.42*	1.91	1.71	0.61	
Face-to-face Interaction	2.54	5.18*	2.38	2.15	0.94	0.26

* Denotes significance at p=0.05 using Tukey's HSD

[z] n = 12

[y] Critical Value 3.08

and auditory cues as better types of communication to encourage interaction. These types of interaction in turn can help to create an environment where students can give and receive support from their peers and feel more integrated.

Summary

Academic and social integration have been shown to be important factors in graduate student persistence (Church, 2008; Gardner, 2008, 2010; Tinto, 1993; Valero, 2001). The findings of this study illustrate some differences in integration between campus based and online students in College of Agriculture programs, specifically that campus based students are more involved in research and social types of interactions than online students. Students in online programs are also less likely to feel supported by their peers. Though this study cannot determine the directionality of this relationship, the idea of social presence which both stems from interactions with other students (Moore and Kearsley, 2005) and helps make interactions meaningful and engaging (Rourke et al., 2001) may be useful in understanding the results. These results also showed that though graduate directors of online Agriculture programs consider director/instructor to student relationships important, they do not consider student to student relationships as important. This combined with the results showing that asynchronous text communication is used more frequently than synchronous forms of communication illustrate that perhaps there is a deficiency of social presence between students in online Agriculture programs, which could be playing a role in online student's levels of integration in their programs.

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Case Study of Experiential Learning through a Training Model at the Science and Policy Interface: The National Animal Health Policy and Food Security Course[1]

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Abstract

Experiential learning provides an opportunity for students to bridge classroom and research knowledge and experiences with the realities of creating solutions for difficult policy issues. Experiential learning becomes even more powerful for capacity building when it involves cultural and geographic diversity and multiple public and private institutions. Our next generation of leaders will need these bridging experiences to address and solve global challenges like climate change, food security and transboundary diseases. These challenges cannot effectively be solved by individual countries or institutions and require creating new frameworks and partnerships that are transdisciplinary and global. The objectives of this paper were 1) to describe an experiential learning experience through the National Animal Health and Food Security Policy course conducted in Washington DC and 2) discuss ways the curriculum of this multi-institutional course could be internationalized and adopted globally. The paper discusses possible ways of internationalizing this course including: formation of partnerships with institutions that are already involved in multi-institutional global courses; involvement of international agencies whose missions align with the national health and food security policy course; and signing memoranda of understanding among governments to use this course for capacity building for their public servants.

Key words: Animal production, animal health, food security, science, policy, global higher education

Introduction

Experiential learning involves a number of approaches and practices but in all instances focus on the things the learner brings to the experience as well as what they gain from the experience (Stanton and Grant, 2002). Experiential learning provides an opportunity for students to gain tangible experience while still enrolled at their schools or universities; it combines classroom knowledge with real world experience (Brandeis University, 2013). Experiential learning provides a practical approach to learning (Stanton and Grant, 2002), and has been reported to be an effective way for students to share their experiences with others (Brandeis University, 2013). Through this mode of training, students acquire confidence to apply the knowledge they have attained (Brandeis University, 2013). Additionally, experiential learning is an opportunity for students to convert their class work into life experiences (Brandeis

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University, 2013) as it enables students to network with several professionals in their field of study (UNESCO, 2012), and offers an opportunity to obtain career related experiences (UNESCO, 2012). According to Stanton and Grant (2002), experiential learning can be implemented through: planning for the experience, increasing the participant's awareness of the experience, assisting the learner to reflect upon the experience and providing experiences to the participants.

A multi-institutional approach of offering jointly planned and implemented courses comes with many advantages but importantly the formation of partnerships and collaborations. Currently, funding organizations are encouraging institutions to follow that approach (Golsmith and Manly, 2003) by preferentially awarding funds to support research and education initiatives. One of the perceived advantages of multi-institutional partnerships, particularly those with globally diverse partners, is enhancing capacity of our next generation of scientists and leaders to address issues that have global contexts (Golsmith and Manly, 2003). It also enhances the quality of the outcomes from projects being run by these institutions (Golsmith and Manly, 2003) as different institutions have different capacities and specialties. Therefore, this pedagogical method provides a platform for different institutions to tap into each other's resources thereby improving efficiency (Anderson et al., 2008). Additionally, this approach enables students to easily tap into new available career opportunities (Anderson et al., 2008). The model provides enhanced networking opportunities for students, faculty and institutions. It contributes to professional development among the faculty through multi-institutional peer interaction (Anderson et al., 2008) and is an opportunity for faculty to extend their specialty to a diverse student audience globally (Anderson et al., 2008). The multi-institutional approach enables student's access and choice among the different academic programs while enhancing the outsourcing of services, materials and technical help among the member institutions (Anderson et al., 2008).

Over the past decades, globalization of instruction, outreach and research has been a major focus for higher education institutions (AIEA, 2013). In particular, educational institutions are attempting to address global issues, such as transboundary diseases that move globally and cause serious socio-economic damage across national borders. These types of issues can only be effectively addressed by applying a global approach (FAO, 2013). Establishing international courses to build capacity worldwide is one of the ways to confront these complex global problems. Several courses have been developed to address global issues, including the global animal health course offered by Washington State University described elsewhere (Ekiri et al., 2013). The outreach efforts resulting from such global programs have been credited for contributing to the building of a healthier world.

Washington State University, in collaboration with the University of Minnesota, University of California Davis and North Dakota State University, offers a National Animal Health and Food Security Policy (NAHFSP) course. This is a one week experiential learning course conducted in Washington DC. This program evaluates the roles of science, politics and beliefs on the development and implementation of policy at the intersection of animal health and food security. Each program is built around a specific topic at that intersection and has included antibiotic use in animal production, animal care standards and climate change. The course is not focused on creating policy but to have participants work with legislators, agency personnel, advocacy groups, media and interest groups to understand the processes of policy development and implementation and how they differ across organizations. The course promotes the development of leadership and communication skills and provides opportunities for participants to network with leaders in food security, public health, agriculture (WSU, 2013a).

The NAHFSP course was developed using U.S. institutions and its processes as a model, but the issues are global and the participants bring diverse backgrounds and viewpoints. The 2012 and 2013 course participants were nationals of seven countries (Canada, Ethiopia, India, Indonesia, Japan, Uganda and US), and three continents (North America, Asia and Africa).

The objectives of this paper are 1) to describe the NAHFSP course conducted in Washington DC and 2) discuss ways the curriculum of this multi-institutional experiential learning course could be internationalized and possibly adopted globally.

Materials and Methods

National Animal Health and Food Security Policy (NAHFSP) Course: 2013

The 2013 NAHFSP course was offered in Washington DC between March 25 and 29, 2013. The thematic topic for discussion was "Climate Change and Livestock; the Science, Politics and Beliefs and how they affect Food Security" (WSU, 2012). A total of 10 students (Washington State University-2, University of Minnesota-1, University of California, Davis-1 and North Dakota State University-6) attended the course. Academic disciplines of the participating students included Masters in International Infectious Disease Management – 6, Masters in Public Health – 1, Masters in Veterinary Preventive Medicine – 1, Masters in Applied Statistics – 1 and Doctoral student in Food Safety – 1.

Course Objectives

The course objectives were to: understand the governmental processes for creating laws and regulations associated with climate change, food security, trade and animal health; determine the roles the U.S. government, non-governmental organizations, professional bodies and trade organizations have in policy formulation; to distinguish among "scientific findings, personal and organizational beliefs and political agendas as policy

is implemented"; define the different ways how policy can be created and implemented; and effectively communicate facts and opinions to a diverse audience (WSU, 2013a).

It is expected that on completion of the course, participants would be able to: comprehend the responsibilities of the national government for food security, trade and animal health; know and differentiate the various strategies used by groups when informing and influencing policy makers; appreciate the roles played by the private sector in enhancing global food security and animal health systems; and be in position to create policy briefs and present them to policy makers (WSU, 2013a).

Learning Strategies of the Course

The course has four learning strategies which include: 1)"Background readings" (WSU, 2013a); 2) Directed discussions and debate around a current issue (WSU, 2013a); 3) "Experiential learning through interactions with key officials" (WSU, 2013a); and 4) Group task discussions; development and delivery of presentations to inform and persuade policy makers (WSU, 2013a).

Background Reading Material The 2013 course participants received course materials to read prior to travel to Washington DC. The course materials included topics that addressed the theme for that year (climate change), and in 2013, these included; Legislative activity, 113th Congress, SB7, a bill addressing formulations of strategies to improve the resilience of the US towards the effects of climate change and those which would reduce or prevent the worsening of extreme weather conditions (GAO, 2013). The following materials were also provided:

a) Government Accountability Office (GAO)'s 2013 high risk series update that provided the current high risk list of topics that Congress needed to address. Climate Change was among the topics on this list. This document provided an insight on the role of GAO in identifying which projects US Congress spends funds on (GAO, 2013).
b) GAO documents on climate change. A website available to all students which contained reports on climate change addressed by GAO to congress. This link gave students an idea of the current situation concerning climate change on Capitol Hill (WSU, 2013b).
c) United States Department of Agriculture (USDA) climate change adaptation plan, June 2012. This document highlighted the USDA 2010-2015 strategic adaptation plan for addressing climate change (USDA, 2012).
d) National Climate Assessment document on adaptation. This highlighted the need and involvement of the different federal agencies in formulating climate change adaptation plans (Blair et al., 2013).
e) Environmental Protection Agency (EPA) report on the impact of climate change on agriculture (EPA, 2013).

The 2013 Washington DC based program was focused on U.S. legislative and agency activity associated with adaptation and mitigation strategies to address climate volatility. Climate change poses unprecedented challenges to U.S. agriculture because of the sensitivity of agricultural productivity and costs to changing climate conditions (USDA 2013). Animal health and livestock production systems have an important role in food security and are being affected by climate volatility. The 2013 program focused on both risk management and mitigation strategies for livestock and poultry value chain systems to address the long term viability of the industries. Examples of adaptation strategies relevant to animal health and livestock production include developing drought, pest and heat stress resistance in crops and animals, integrating livestock with crop production systems, improving soil quality and minimizing off-farm flow of nutrients and pesticides (USDA 2013).

While it was still early in the legislative cycle for the 113th legislative session, there were opportunities for students to share their experience and perspectives through interactions with committees, agencies and various interest groups on the topic of climate change. This group of students focused on risk management strategies for the food system with an emphasis on animal health and food production and how these strategies impact both food security and mitigation proposals. By the end of the week, participants drafted a set of policy statements which they delivered to congressional representatives and strategic agency officials. The positions of students were based on published research, advice from experts within and outside government with a variety of viewpoints and data and participant expertise. In addition, course participants developed and delivered comments on the EPA's proposed climate Adaptation Plan and/or the National Climate Assessment Report.

Experiential learning through interactions with key officials. During the 2013 one-week program, several interactive meetings were held between students and key officials of selected agencies and organizations. The various agencies that students visited included: The American Veterinary Medical Association (AVMA), The Environmental Protection Agency (EPA), The US Department of Agriculture (USDA), The US Government Accountability Office, The National Academies of Sciences, The U.S. Congress (a few selected members of the Senate and House of Representatives), The American Farm Bureau, Food Research and Action Center and The Star Tribune (McClatchy Newspapers). A schedule of the 2013 one-week program is attached (Table 1).

On the first day, the program co-coordinator provided an overview on the theme of the 2013 course and defined the course outcomes followed by an open discussion on climate change, animal health and food security. The science on climate change was discussed.

Table 1: Schedule for the National Animal Health Policy and Food Security Course in Washington DC, March 25 to 28, 2013.				
	Monday March 25	Tuesday March 26	Wednesday March 27	Thursday March 28
8.30 - 9:00	Introduction to Program, organizing groups and defining outcomes American Veterinary Medical Association (AVMA) GRD, 1910 Sunderland Place NW	US Department of Agriculture NRCS, WSU Government Relations 655 15th St NW #225 Washington, DC 20005		National Academy of Sciences
10:00 - 10:30	AVMA US Government 101 Lecture		McClatchy Newspaper 700 12th Street NW, Suite 1000,	
10:45		American Farm Bureau. 600 Maryland Ave SW, Suite 1000		
11:00				Congressional Visits
11:30 - 12:30				Congressional Visits
1:00	AVMA Federal Relations. 655 15th St NW #225 Washington, DC 20005	Congressional Visits	Food Research and Action Center, 1875 Connecticut Ave Suite 540 NW	
2:30 - 3:00				Program Debrief
3:30	Environmental Protection Agency, 1301 Constitution Ave NW		Government Accountability Office (GAO), AVMA GRD Office, 1910 Sunderland Place NW	Congressional Visits
4:00 - 5:30				Program Debrief

The Assistant Director of AVMA gave a presentation on the organization of the U.S. government and an insight on how AVMA affects policy formulation directed to animal health and welfare. This enlightened the participants on the roles of the different arms of the US government, policy formulation and the roles of AVMA and how it interfaces with policy makers on Capitol Hill to influence policy regarding animal issues. The AVMA federal relations officer provided an overview of how his office represents different organizations and institutions (for instance universities) to Congress. This talk on lobbyists helped course participants understand the role of lobbying to policy makers and the need to maintain a good working relationship with policy makers in order to advance your agenda to the legislative assembly. This interface also helped course participants understand the role of forming public-private partnerships to ease lobbying for certain bills.

The Director of the EPA Innovative Pilots Division explained the role played by EPA and its operations including the EPA's adaptation plan. This visit helped students understand the roles played by EPA on the issue of climate change and the challenges they are facing. A senior scientist at the USDA Natural Resources Conservation Service briefed the group on the USDA climate change adaptation strategies implemented by different USDA departments in coordination with various agencies. A meeting with the Director of Public Policy Congressional Relations at the American Farm Bureau provided the position of this organization on climate change. This discussion helped students comprehend the need for involving stakeholders who would be affected by the proposed bill. It was clear that their views are vital in coming up with policies which would benefit the nation.

Several visits were made with various congressional staffers. A meeting was held with the AVMA fellow at Senator Susan Collins' office who worked primarily on food safety and public health issues; he discussed how to make policy briefs and how to utilize science to influence public policy. Visits were made with other congressional staffers from different states and political parties to discuss climate change and the need to have adaptation and mitigation strategies in place. Participants had an opportunity to present their policy briefs to legislative representatives.

A visit to the McClatchy group provided an opportunity to learn how to use the media to communicate science and other issues. The need to make communication simple and the use of compelling personal stories to communicate was highlighted. Media as a common communication channel with the public plays a significant role in driving policy formulation.

Students visited The Food Research and Action Center Supplemental Nutrition Assistance Program (SNAP) (FRACS, 2012) offices. The FRACS program deals with food security issues and given that climate change has an impact on agricultural productivity, FRACS emphasized the relevance of having lobbyists to help advance an agenda to congress on climate change mitigation and adaptation. The FRACS Director emphasized the need to build relationships with people in congressional offices who would assist with advancing issues.

Also, participants learned about the activities of the Government Accountability Office (GAO) and the role it plays in auditing government agencies (GAO, 2013). At the National Academy of Sciences, course participants met with the Chair of the Board on Agriculture and Natural Resources, who provided a brief on the role of the academy as an independent body that advises

government on science matters (NAS, 2013). Literature exists to show that the issue of climate change was still a puzzle for many people (Keohane, 2013). Therefore, it would be beneficial to all if federal agencies worked with the academy to do comprehensive research on the reality of climate change. Perhaps the results from these studies would aid in formulation of policy towards climate change mitigation and adaptation strategies.

The sessions with key officials of selected agencies and organizations involved presentations and or talks with key officials in the different agencies and organizations. The participants got involved in the discussions by asking questions and providing their views on the issues that were discussed which revolved around climate change mitigation and adaptation. Evening sessions were used by course participants to summarize what had been learned in the day.

Group task discussions. Each student was assigned a group where they held discussions and formulated a policy brief based on literature review, their experience and research. Participants then made oral presentations to the various congressional representatives on Capitol Hill.

Multi-institutional aspect of the course. This course is a joint collaborative effort of several higher educational institutions including: 1) Paul G. Allen School for Global Animal Health and College of Veterinary Medicine at Washington State University; 2) Wildlife Health Center at University of California, Davis; 3) Global Initiative for Food Systems Leadership and the Center for Animal Health and Food Safety at University of Minnesota; and 4) Department of Veterinary and Microbiological Sciences, North Dakota State University. In 2013, six international exchange students from Makerere University, College of Veterinary Medicine, Animal Resources and Biosecurity, Uganda attended the course.

Potential for Internationalizing the Course

Currently this course was developed with a national focus on the US, examining U.S. policies at the intersection of environment, animal agriculture and food security (WSU, 2012). However course participants have normally taken on a global nature. In 2013, course participants were from three different countries (Indonesia, Uganda and US) while in 2012, course participants were from six countries (Canada, Ethiopia, India, Japan, Uganda and U.S.). By nature of the institutions and programs participating in the course, the global nature of the course is likely to grow. For instance, the students enrolled at the Paul G. Allen School for Global Animal Health and College of Veterinary Medicine at Washington State University are globally focused. Also, international programs such as Global Initiative for Food Systems Leadership at the University of Minnesota and the Master of Science in International Infectious Disease Management and Biosecurity offered

by the Department of Veterinary and Microbiological Sciences, North Dakota State University and College of Veterinary Medicine, Animal Resources and Biosecurity Makerere University in Uganda are global by nature.

Currently informal exchange of information occurs between participants. An international component of the course could be introduced to the curriculum in the future to tap into the already existing pool of international course participants. For instance, a comparative aspect of the course could be added to allow participants to contrast policies and processes in different countries and regions. For programs with themes such as climate change that are global issues (Houghton, 2007), comparative approaches to governance and approaches for informing policy will broaden participant's understanding of creating global policy. A clear outcome from this approach is appreciation that global issues with important worldwide consequences are still greatly influenced by national interests. Further, the processes that scientists working within a country can use to facilitate national participation in solving global issues can and should be informed by local, regional and global governance processes. The U.S. based policy example underscores the complicated process of policy formulation, the difficulty the US faces in joining with the world on global climate change policies such as the Kyoto Protocol.

Comparison with Existing International Programs

Michigan State University Program. The University of Michigan offers a global scholars program that gives an opportunity to students to learn and associate with other international students on campus and around the globe (The University of Michigan, 2012). This course enhances the multicultural aspect while equipping students to be in position to work with different cultural groups. These students are encouraged to apply for jobs abroad and gain from the rewards of the program (The University of Michigan, 2012). The National Animal Health and Food Security Policy course could be modified based on existing models such as the Michigan State University Program to add an international aspect to the course which is currently absent. This addition would add value and enrich the course.

The National Policy Process seminar offered by Portland State University in Washington DC. This is a policy course for professionals and students from the Pacific Northwest (Portland State University (PSU), 2013). This course is conducted in Washington DC where participants personally meet with policy experts, congressional members, President's staff and lobbyists and with national agency representatives (PSU, 2013). It is a one week program which mainly focuses on the policy formulation process and how this affects their work in the Northwestern U.S. (PSU, 2013). This course only targets professionals from one region of the US, and is limited to only policy issues. However it is similar to the National Animal Health Policy course in that both

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provide an opportunity to the participants to meet with congressional representatives and also focuses on the process of policy formulation (PSU, 2013; WSU, 2012a). Both courses use a case study approach and give participants a chance to personally meet with the key officials on Capitol Hill (PSU, 2013; WSU, 2012a).

Ways of Internationalizing the National Policy course

A number of ways of internationalizing the NAHFSP course are suggested. First is formation of partnerships with institutions that are already involved on a global scale. This requires identification of institutions of higher learning in the different regions of the world that are involved in offering such a course. Many international programs have been established through formation of partnerships. For instance, a master's degree in International Infectious Disease Management was developed through the formation of partnerships between U.S. and African institutions (Ekiri et al., 2013; COVAB, 2013).

Second, involving international agencies whose mission aligns with the NAHFSP course objectives. International agencies are key players in promoting higher education on a global scale (Spring, 2008; Shahjahan, 2013). These agencies play a significant role in introducing changes to the national education system thus influencing educational debates in the world (Shahjahan, 2013). Organizations like Food and Agriculture Organization (FAO) (FAO, 2013), United Nations Education, Scientific and Cultural Organization (UNESCO) (UNESCO, 2012) and World Health Organization for Animals (OIE) have their missions aligning with the objectives of this food security course thus can be helpful in supporting this course. Finally, signing agreements among different governments (Noris, 2005). Governments should be encouraged to incorporate this course as a capacity building tool for public servants.

Assessment of Student Learning Outcomes

At the end of the NAHFSP course, students were expected to have mastered the following outcomes: 1) Explain the legal authorities of a National government as it relates to food security, trade and animal health, 2) Distinguish various strategies that groups use to inform and influence policy, 3) Demonstrate a role that the private sector has in enhancing global food security and animal health systems, 4) Synthesize a policy perspective utilizing a complex knowledge base that includes scientific findings, beliefs and politics, 5) Demonstrate an ability to understand the multiple dimensions of policies and synthesize diverse opinions and data to create informed policy and 6) Present a cogent argument that informs policy that would be understood across a diverse audience (WSU, 2013a). The learning outcomes were assessed in various ways. At the end of each day, a debriefing session was conducted where students and

faculty were able to review what had been learned that day. Additionally, students were given specific group assignments that helped them comprehend materials that were presented at the various sessions held. Students were then required to summarize the assignments and share with the class. Students prepared policy briefs and presented them to Congressional staff from the two main US political parties. Student exit interviews were conducted at the end of the course and documented in form of video clips which were transcribed and included in reports submitted to course instructors and to funding agencies. Student rating of instructors (SROI) evaluation system was utilized in an anonymous manner where applicable and ratings for the instructors and the course reported.

The 2013 NAHFSP course utilized a Problem Based Learning (PBL) approach by identifying climate change as the problem and letting students address the problem using the experiential learning conducted in Washington DC while interacting with staff from various national agencies. This approach of teaching (PBL) has been described as effective and resource efficient as it allows one or two staff members to facilitate up to 30 students at any one time (Hyams and Raidal, 2013). Also utilizing small groups (up to six) or teams of students affords important pedagogical benefits derived from uniform facilitation across multiple groups, enhanced discussion and debate between groups and the development of self-facilitation skills in students (Hyams and Raidal, 2013). This model has been reported to be effective provided that several requirements are addressed including a suitable venue, large whiteboards and a structured approach to support student engagement with each disclosure, a detailed facilitator guide and an open, collaborative and communicative environment. Most of these requirements were provided by the NAHFSP course.

Conclusions and Recommendations

The National Animal Health and Food Security Policy course is an experiential multi-institutional course that has been addressing issues of global significance at a national level. The course curriculum could be internationalized, expanding its scope to address these topics at an international level. As currently structured, the course already has elements such as an international pool of participants that could be easily utilized to add an international scope to the course. Also, a similar experiential learning model could be supported in the developing world possibly through already existing networks and partnerships such as The Africa-US Higher Education Initiatives of Higher Education for Development (HED) funded by the US Agency for International Development (USAID), and involving international agencies whose missions align with the national health and food security policy course objectives.

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Students' Perceptions of an Agricultural Communication Lesson and an Experiential Learning Activity in Secondary Agricultural Education Classrooms

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Abstract

Agricultural communications (ACOM) curriculum is important to prepare students for diverse, agriculturally-related careers. Due to lack of secondary ACOM curriculum, postsecondary initiatives have focused on instructional material development. This descriptive study examined secondary agriculture education students' perceptions of ACOM curriculum. Researchers' sought to determine how students received a writing lesson taught through traditional classroom delivery with an experiential activity. Students (N = 630) from nine agricultural science programs in Arkansas completed a four-part instrument at the conclusion of the lesson. Based on the findings of this sample, the majority (52.7%) of students enrolled in agricultural science courses were unfamiliar with ACOM. The majority (67%) of students enjoyed the writing lesson and would not change anything about the delivery or activity. For future instructional delivery, participants preferred to learn via hands-on (75.9%), group (64.1%), or project (42.1%) activities. Most students were not aware of the opportunities for careers associated with ACOM (52.7%), but were most interested in learning more about design (40.8%), multimedia (31%), writing (21.3%) and careers (18.3%). Students enrolled in agricultural science courses enjoyed experiential learning activities when used to complement traditional teaching delivery. Although, ACOM curriculum is not in place in Arkansas high schools, 42.1% of students were excited and interested in learning about the various aspects of this growing field.

Introduction

Today's youth are digital natives. They are typically proficient and enjoy learning about and with visual and communication technologies (Margaryan et al., 2011). These individuals are today's students in secondary and postsecondary schools and we must find ways to teach and engage them with the technology they are already inclined to use. Pennington (2012) noted that "*postsecondary and secondary education today is a dynamic educational environment as new electronic technologies and their educational potential emerge*" (p. 2). The use of emerging technology in secondary school programs allows for the acquisition of new knowledge, and in some students induces curiosity and a need for learning (Edgar, 2012). Edward Thorndike applied scientific psychology toward learning, thus altering the view of how learning occurs (Wiburg, 2003). Thorndike (as cited in Wiburg, 2003) postulated that students, when presented with innovative or new items, create a psychological impact resulting in a defined need to understand the information. Rosenshine and Furst (1971) posited that with clarity and variability, students would be more inclined to learn. Because of this, educators must account for students' thoughts, beliefs and feelings when teaching (Bigge and Shermis, 1999; Gredler, 2005; Schunk, 2004).

The Vocational Education Act of 1963 expressed vocational education as courses used for training students for paid or unpaid employment (Hayward, 1993). Additionally, the act recognizes agricultural education courses as preparing individuals for college studies. This preparation for the workforce can be realized through modified teaching methods that include reflective learning and hands-on engagement. When teachers incorporate experiential learning into their lessons students acquire real-world knowledge that may assist them in a successful career in an agriculture-related field upon finishing his or her education. Similarly, constructivism is a relatively recent term used to represent a collection of theories, including generative learning (Wittrock, 1990), discovery learning (Bruner, 1961) and situated learning

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(Brown et al., 1991), whose premise describes learning based on constructed experiences. This innovative curriculum, which includes differentiated teaching and learning processes, motivates teachers and students to learn and allows opportunities to gain knowledge using state-of-the art technology.

"As agricultural education enters the twenty first century, [education and agriculture] must change with emerging trends in society and the agricultural industry" (Talbert et al., 2005, p. 61).

Bailey-Evans (1994) suggested that with increasing accessibility of technology and as society becomes more disconnected from the farm, communication becomes vital to the promotion of agriculture. The lack of knowledge about agriculture and the advancement of business-oriented industry in agriculture have produced a need for universities to include agricultural communications (ACOM) curriculum in the traditional agricultural education programs (Birkenholz and Craven, 1996). The promotion of agriculture is imperative to the existence of the industry and remains a need at the forefront of agricultural education. ACOM curriculum should be included when preparing students for diverse agriculturally-related careers.

ACOM offers career choices for students wanting to work in an agricultural-related field, *"because a large percentage of the population lacks agricultural under-standing, it's important for agricultural communicators to provide timely, accurate information on current issues and events"* (Hartenstein, 2002, p. 1). Agricultural communicators are uniquely prepared to promote agriculture because they are familiar with all aspects of the industry. They also have access to valuable resources: Cooperative state, research, education and extension service personnel; farmers and ranchers; veterinarians; and agriculture, food and natural resource scientists.

Currently, minimal ACOM curriculum exists in high schools. However, in 2000 the National FFA Organization added ACOM as an official Career Development Event (CDE) area, creating a national contest for students interested in ACOM as a future career path. According to the National FFA Organization (2002), FFA members who are interested in pursuing a career in agricultural communications and journalism or who are looking to build additional communications skills are encouraged to participate in the ACOM CDE providing an educational experience upon which to build. Texas and Oklahoma are currently the only states with curriculum to support the ACOM CDE, and the National FFA CDE superintendent has expressed the need for development of training materials that could be used by agriculture teachers nationally to prepare their students for the CDE (Erica Irlbeck, personal communication, October 14, 2012). The purpose of this study was to determine teaching style preference by secondary agricultural students, determine interest in ACOM curriculum topics and assess students desire to pursue degrees in ACOM after high school graduation.

Theoretical Framework

The theoretical framework for this study reflects student learning styles. Learning is an active process where the learner uses sensory involvement and constructs based on prior learning and experiences (Hein, 1991). Many researchers argue that education comes from experience; however, according to Dewey (1938), not all experiences are educative. Kolb (1984) proposed a theory of experiential learning that involved four principal stages: concrete experiences (CE), reflective observation (RO), abstract conceptualization (AC) and active experimentation (AE). These teaching methods allow students to reach application, analysis, synthesis and evaluation, which are higher tiers in Bloom's Taxonomy of learning (Bloom et al., 1956). "Learners are expected to understand the applications they are learning" (Edgar, 2012, p. 7), and should be able to do more than simply act on memorization. In a study conducted by Fraze et al. (2011) ACOM was introduced with activities emphasizing leadership, photography, writing, video production and Web design to broaden students' perspectives of career opportunities in agriculture. Researchers concluded that hands-on experiences affected students' identification of careers they could pursue with an agricultural science degree.

The concept of experiential learning is a time-honored approach in the practice of adult education (Miettinen, 2000). The history of experiential learning dates back to the 4th century B.C. when Aristotle stated "…using the language of knowledge is no proof that they possess it" (University of California Science, Technology and Environmental Literacy Workgroup, n.d., p. 2). The same concept applies today as employers begin to place more value in experience instead of grade point averages when in pursuit of employees.

Etling (1993) described three types of learning: traditional, performance-based and experiential, with experiential being the least structured of the three. It is difficult to classify secondary agricultural education programs into a category because it should be a collaboration of all three. "*When students' everyday experiences are interpreted and augmented by their peers or parents this is typical of informal education*" (Etling, 1993, p. 3). In a study by Robinson et al. (2007), eight employability skill constructs were deemed a high need for curriculum enrichment. These included: (1) problem-solving and analytics, (2) decision making, (3) organization and time management, (4) risk taking, (5) listening, (6) creativity, innovation and change, (7) lifelong learning and (8) motivation.

Felder and Silverman (1988) recommended connecting student experiences to the course material, creating a balance between concrete information, abstract concepts and practical problem solving methods; using illustration to reinforce intuitive patterns; the integration of visual, oral and written explanations; and the incorporation of computer technology to enhance the information dissemination to students. Felder and Silverman (1988) also advised allowing students enough

time to answer questions during lecture and cognitive activities, providing opportunities for collaborative learning, and rewarding students for participation and creativity to enhance student perceptions of information. A study conducted by Javenkowski and Schmidt (2000) concluded that the effectiveness of classroom instruction may be increased by "employing multiple teaching strategies to accommodate all learning styles exhibited by a group of students" (p. 28).

There is a need to determine secondary students' preferred learning methods to tailor ACOM curriculum to better meet the needs of students and the agricultural industry. This study assessed secondary agricultural education students' perceptions about ACOM curriculum through traditional delivery (lecture) with an experiential learning activity. Students' preferred learning styles were assessed based on an ACOM lesson to determine student knowledge gained.

Methods

During the fall 2012 semester, a lesson from the proposed ACOM curriculum for secondary agricultural science programs was tested in high schools across Arkansas. All secondary agriculture instructors in Arkansas were contacted via a listserv and given the opportunity to have an ACOM lesson taught in their classrooms on a Friday of their choosing from September through November 2012. There were nine Fridays available and scheduling was first-come-first served.

A lesson from the writing module of the curriculum was chosen to be piloted in the participating classrooms. The lesson, titled "Writing a Lead" was introduced with a Prezi presentation that allowed students to actively participate in the discussion, providing abstract conceptualization and concrete experiences of the concepts (Kolb, 1984). The 15-minute lecture briefly touched on topics such as: (a) inverted pyramid style, (b) the who, what, when, where, why and how (5 W's and H) of a news article, (c) Associated Press (AP) style, (d) interviewing skills and (e) how to write a news lead. At the conclusion of the Prezi the researcher reviewed students on what they had learned and allowed them enough time to ask question, as well as rewarded students for participation and creativity as advised by Felder and Silverman (1988). The researcher then asked participants to split into partners for the activity.

The activity portion of the lesson, titled "You be the Reporter" required the students to interact with each other while reinforcing the skills they had just learned through active experimentation (Kolb, 1984). Each student was given a list of bulleted facts pertaining to a newsworthy event. There were six newsworthy events, allowing multiple students to write about the same topics. Students were instructed to work with their partner to interview each other and identify the 5W's and H listed on their event cards. They were then to take those facts and arrange them, in order of importance, into a lead paragraph for a news article. Once students completed the activity they shared their lead paragraphs with the

rest of the classroom. The students engaged in reflective observation as they discussed the good aspects of each lead and gave suggestions on how to make each one stronger (Kolb, 1984). This exercise not only tested for content learned during the lecture, but also allowed the students to engage in experiential learning and develop the eight employability skill constructs (Kolb, 1984; Robinson et al., 2007).

The researcher administered the instrument, after the activity, during the last ten minutes of each class period. Prior to distributing the instrument, the researcher explained the purpose of the study and explained to the students that participation was voluntary and that all responses would be anonymous. The sample for this study consisted of students from nine agricultural secondary education programs across the Arkansas (N = 630). The response rate, for the secondary agricultural science students who participated in the lesson was 100%.

The student survey contained four parts. Part I focused on prior knowledge held by students of ACOM as well as perceptions of the writing lesson completed before completing the instrument (using a 5 point Likert-type scale where 1 = "Strongly Disagree" and 5 = "Strongly Agree", multiple choice and yes/no questions). Part II listed ACOM topics and asked respondents to indicate which areas they would like to learn about. Part III assessed student interest in ACOM as a whole. Part IV focused on participant demographic characteristics including grade level, number of agriculture courses the student has been enrolled in and if they are interested in a career in ACOM.

A panel of faculty members (from agricultural communications and education) examined the instrument and judged it to possess face and content validity. Cronbach's Alpha was used to test the reliability of the instrument. The Cronbach's Alpha value for the instrument was 0.94, 0.92 and 0.96 for Part I, II and III, respectively. The reliability of the demographics was not assessed; according to Salant and Dillman (1994), responses to non-sensitive demographic items "are subject to little measurement error" (p. 87). Data were analyzed using descriptive statistics.

Results and Findings

Of the 603 students from nine agriculture science programs in Arkansas who participated, 63.7% were male and 34.8% were female with 1.5% not specifying a gender. Representing the sample group, 480 self-identified as Caucasian (76.2%), 48 as Hispanic (7.6%), 32 as African American (5.1%), 15 as American Indian (2.4%) and three as Asian (0.5%). Eleven reported being of "other" race (1.7%) and 14 did not specify an ethnicity (6.5%).

The participants (N = 603) were asked how many agriculture classes they have taken including the current semester. Forty-four students reported none. There were 408 students who reported having 1 to 2 courses (64.8%). Of the remaining participants, 123 reported

Figure 1. Number of agricultural courses participants had taken to date.

■ 1 to 2
▨ 3 to 4
□ 5 to 6
▨ 7 or more

Figure 2. Aspects of the lesson students would change to improve it for future use (N = 630).

Figure 3. Preferred learning styles of students enrolled in agricultural science courses (N = 630).
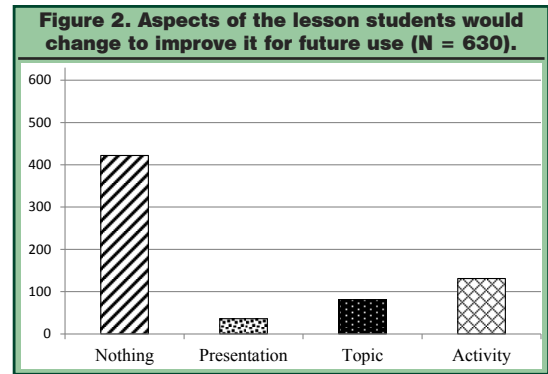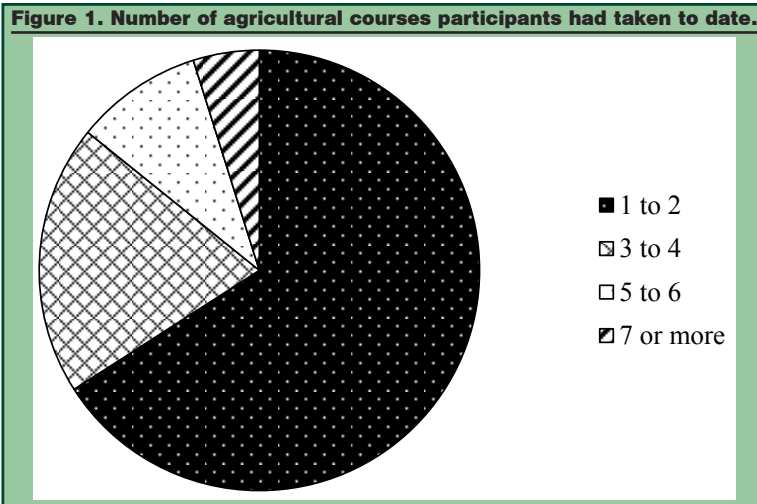
Table 1. Participant perceived agreement towards "Writing a Lead" (N = 630).			
Statement	n	M	SD
I had fun participating in the lesson	624	4	1.01
I learned a new writing skill from the lesson	18	3.79	1.22
I understand the concepts in the lesson	21	4.23	0.95
I would like to learn more about agricultural communications	13	3.42	1.23

Note. Responses based on a 5-point Likert-type scale with 1 = Strongly Disagree to 5 = Strongly Agree.
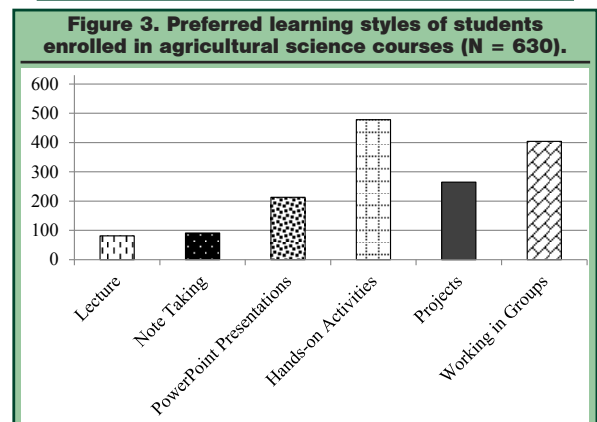
3 to 4 classes (19.5%), 58 reported 5 to 6 (9.2%) and 30 students reported seven or more agriculture courses (4.8%). Participants reported if they could see themselves working in an agricultural career after graduating from high school; 13.8% declared definitely yes (n = 87), 20.5% stated probably yes (n = 129), 32.7% were unsure (n = 206), 20.2% said probably not (n = 128) and 11.1% stated definitely not (n = 70). Refer to Figure 1 for a visual representation of the number of agriculture classes the participants have taken.

To begin, participants were asked if they were familiar with ACOM before the writing lesson was delivered, 43.5% stated "yes" they were familiar (n = 274) and 52.7% stated they were not (n = 332). The next section of the instrument asked questions pertaining to the presented lesson as well as the student's interest in learning more about ACOM, refer to Table 1. Participants somewhat agreed that they had fun participating in the lesson (M = 4.00, SD = 1.01). Participant responses ranged from undecided to somewhat agree when asked if they learned a new writing skill from the lesson (M = 3.79, SD = 1.22). Students understood the concepts in the lesson (M = 4.23, SD = .95) and ranged from undecided to somewhat agree they would like to learn more about ACOM (M = 3.42, SD = 1.23).

When participants were asked what they would change about the lesson to improve it for other students, 67% indicated they would not change anything about the lesson. However, 20.8% of the participants felt the activity should be improved. The percentages for this section equal more than 100% because the participants were permitted to check more than one option. Figure 2 represents what the participants would change about the lesson to improve it for future students.

The participants were asked what type of learning they preferred next. Out of the sample group, 75.9% indicated they liked hands-on activities, 64.1% favored working in groups and 42.1% enjoyed projects. A smaller percentages of students preferred PowerPoint presentations (33.8%), note taking (14.4%) and lecture based lessons (12.9%). The percentages for this section equal more than 100% because the participants were permitted to check more than one option. Refer to Figure 3 for the preferred type of learning for the participants.

For the next section of the instrument, students were asked to identify the specific aspects of ACOM they were interested in learning more about. Overall, by module, students were most interested in learning about elements of design (40.8%), with multimedia (31%), writing (23.3%) and careers (18.3%) following. The percentages for this section equal more than 100% because the participants were permitted to check more than one option.

Within the writing module the highest percentages of student interests were in interviewing (30.6%), journalistic writing (22.1%) and news stories (18.4%). The design module drew the most interest from the students, with 52.5% wanting to learn more about photography. The students expressed interest in graphic design (42.5%) as well. With respect to the multimedia module, social media (35.6%), web design (33%) and digital video production (31.3%) all sparked comparable interest with the participating students. The careers module was the least preferred, by the students, of the four modules. There was some interest, however, in the skills needed to obtain a career in ACOM (23.4%). Figure 4 represents what topics the participants would like to learn in an ACOM class.

Figure 4. Agricultural communications topics students are interested in learning more about (N = 630).

Writing (*f* = 147)
- Journalistic Writing
- Interviewing
- Writing a Press Release
- Writing News Stories
- Writing Feature Stories
- Writing for PR and Marketing

Design (*f* = 253)
- Photography
- Photo Manipulation
- Graphic Design
- Logo and Advertisement Development
- Electronic Print Design Layout

Multimedia (*f* = 195)
- Web Design
- Digital Audio Broadcast
- Digital Video
- Social Media

Careers (*f* = 115)
- History and Origin
- Skills Needed and Opportunities
- Degree Preparation

Because there is currently not an ACOM course available for high school students in which to enroll, students do not have an opportunity to obtain the above skills. We asked the students if they would enroll in an ACOM if it were available. According to the students, 42.1% would enroll in an ACOM course (n = 245) and 54.8% would not (n = 345). Concluding the post-lesson instrument, students were asked if they would be interested in participating in the agricultural communications CDE. Students seemed to be interested in competing with 51% indicting "yes" and 33.2% recording "no."

Summary

Based on the findings of this sample of participants it can be concluded that over half of the students enrolled in agricultural science courses across Arkansas are unfamiliar with ACOM. However, when asked which aspects of ACOM they were most interested learning more about, design was most popular followed by multimedia, writing and careers. This supports the finding by Talbert et al. (2005) that agricultural education must adapt to developing trends in society and industry. The findings of this study support the need for an ACOM curriculum in Arkansas secondary agricultural science programs. This research found that students enrolled in agricultural science courses prefer to learn by hands-on activities and working in groups rather than PowerPoint presentations, taking notes and lecture-based learning; this finding is supported by the theory of constructivism, Kolb's (1984) Theory of Experiential Learning, and the study conducted by Javenkowski and Schmidt (2000) that affirms the effectiveness of classroom instruction, may be increased by utilizing multiple teaching strategies.

ACOM skills and competencies can provide opportunities for students beyond high school graduation. The Vocational Education Act of 1963 recognizes that courses train students for employment and success in college (Hayward, 1993). Currently, ACOM curriculum is being piloted in Arkansas for the high school agriculture classroom, and it is evident that students are excited and interested in learning about the different aspects of this unique field supporting the study by Margaryan et al. (2011) stating that students are digital natives. However, based on the findings of this study, students are not aware of what ACOM entails or what it has to offer. Of the 630 participants in this study, 64.8% had taken 1 to 2 agricultural courses. Additional study should focus on an investigation of potential correlations between the awareness level of ACOM competencies and career opportunities and the number of agriculture courses students have enrolled in prior to assessment.

Based on the conclusions of this study, recommendations for practice are as follow. An ACOM curriculum is needed to provide students with skills needed to be successful in today's job market. As conveyed by multiple researchers (Bigge and Shermis, 1999; Gredler, 2005; Schunk, 2004), student perceptions must be considered in order to justify learning. Participants have indicated an interest in the ACOM subject area. Teachers should incorporate hands-on activities and project based learning to teach students the skills needed in an ACOM career. Additionally, as supported by Birkenholz and Craven (1996) and the findings of this study, universities should include ACOM curriculum in traditional agricultural education programs for students who want to further their education in this sector of the agricultural industry.

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Service Learning in Natural Resources Classes: Measuring the Impacts on University Students

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Abstract

The impacts of three service learning courses in the Department of Forestry and Natural Resources at Purdue University on student outcomes were evaluated using pre and post surveys. The three courses engaged a total of 69 unique students in projects intended to benefit the community, but according to survey responses there were differences in courses in terms of course enrollment motivations and desire to help the community after graduation. It was found that generally over the course of the semester, students developed a sense of connectedness and responsibility; a sense of the importance of helping others; and an interest in being personally involved in helping the community in the future. In courses where baseline measures were high, significant changes were not observed over the course of the semester. The survey questions used here were adapted from those typically used to measure the outcomes of courses focused on community development; this study illustrates that these survey questions can also work well for natural resource courses. Overall, the study confirms that service learning in natural resource courses can help produce civic-minded graduates, a goal of many universities and colleges.

Introduction

Service learning is a pedagogical technique in which students perform service for the community while simultaneously learning substantive course content (Furco, 1996; Bringle and Steinberg, 2010). One of the driving motivations for this approach is to produce civic-minded graduates (Bringle and Steinberg, 2010). This motivation is consistent with desired outcomes at many universities and colleges, including Purdue University's College of Agriculture.

As Furco (1996) illustrates, service learning can be contrasted from pure service due to the educational value of the community engagement. In a natural resource context, the continuum from service to learning can be illustrated the following way:
1. Service: Groups of students volunteer to pull invasive plants from a nature preserve.
2. Service learning: Groups of students earn class credit to design and implement a plan to remove invasive plants from a nature preserve based on learning about the characteristics of the plants.
3. Learning: Students earn class credit to identify different invasive plants and learn how to eradicate them.

Numerous scales have been developed to measure the impact of service learning courses on undergraduate and graduate students (Bringle et al., 2004). Traditionally these scales have been used in community development types of courses and not in courses that are focused on improving the natural environment. In fact, a review of the service learning literature found only one study of courses that have a natural resource focus (Tedesco and Salazar, 2006). We undertook this study primarily to see if natural resource focused service learning courses have a positive impact on students. A second objective was to see if scales developed for community development courses could be translated for natural resources courses.

We collectively taught three different courses in the spring of 2010 in the Department of Forestry and Natural Resources at Purdue University that each had a strong service learning component. We surveyed students from each class at the beginning and the end of the semester using questions adapted from several established service learning scales. We hypothesized that, overall,

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students would gain career benefits, a sense of the importance of helping others and an increased sense of responsibility to the community through their experiences in various types of service learning courses. We also hypothesized that the impact of the three courses would be different due to different features of the classes and the students.

Materials and Methods

There are several important factors that should be considered when assessing impacts of service learning such as the motivation behind enrolling in such courses (i.e., required vs. elective) and the course level (graduate vs. undergraduate). Herein, we address both factors among three courses that were recently offered in the Department of Forestry and Natural Resources at Purdue University.

FNR 408, "Natural Resources Planning," is a required course for four of five majors in the department (more information about this course can be found in Prokopy 2009). In this course, students spent the semester working in groups on a watershed management plan for a local watershed. Students presented their ideas to community members in a public poster session at the end of the semester and delivered a written plan. Stakeholders from the community came in to the class to present guest lectures and students were welcome to follow up with these individuals (or other relevant stakeholders) throughout the semester. Spring 2010 was the sixth time the course was taught in this format by the lead author of this paper. The second author was a teaching assistant for this class for five years. In Spring 2010, there were 52 students enrolled in the course; all of them were required to take it (however two students were absent on the first day of class and did not take the pre-survey).

FNR 498, "The Nature of Service Learning," was taught for the first time in the spring of 2011. In this course, taught by the third author, students learned how to design and deliver educational wildlife lessons to elementary students. This course consisted of three modules. The first module introduced undergraduates to successful strategies for the development of environmental education programs. The second module required undergraduates to work in groups and develop original environmental education programs that consist of classroom activities, as well as service learning experiences for elementary youth that benefit the environment and community. During the last module of the course, undergraduates presented their original educational materials to 3rd grade youth for an hour a week over an eight-week duration. Students were only admitted into this class with permission of the instructor and consequently the better-performing undergraduate students in the department took this class. In spring 2011, fifteen students took this class; none were required to take it (i.e., an elective course).

FNR 598, "Ecological Footprints," was also taught for the first time in the spring of 2011 by both the lead and the fourth author. This course was cross-listed between the Department of Forestry and Natural Resources and the Agronomy Department. The course was listed as an upper level undergraduate / graduate course and had a mix of students enrolled from different departments on campus. In this class, the students wrote a grant proposal for a local watershed project for funding to develop an interactive website that community members could use to calculate and improve their ecological footprint (i.e. have a lower environmental impact). Students learned about the different dimensions of ecological footprints as well as how to write a grant proposal. Key stakeholders came to the class and gave presentations about their needs and resources but students did not have much other interaction with the stakeholders barring a presentation at the very end of the semester which was sparsely attended by stakeholders. Eleven students took the class in the spring of 2011; one student was required to take the course as a substitution for another class but the other students took it as an elective.

A survey instrument was developed based on existing scales from other studies that measured the effectiveness of service learning. This survey instrument was given to students on the first day of each class. There was some overlap between students in the courses; six students were enrolled in both FNR 408 and FNR 498 while one student was enrolled in both FNR 408 and FNR 598. Therefore, students enrolled in more than one of the classes completed the entire survey in the first class they attended. In the second class, they answered only questions specific to that course. A virtually identical survey was then distributed on the last day of each class.

To ensure consistency between courses, students in each were presented with the same PowerPoint lecture about service learning at the beginning of the semester after they took the baseline survey. Students also wrote at least three reflections about their experiences in each class (see Correia and Bleicher, 2008 and Hatcher et al., 2004 for more about the use of reflections in service learning classes). This study was approved by the Institutional Review Board at Purdue University (IRB# 0912008745).

The Survey Questions

Both the pre- and post-surveys were four page questionnaires that contained six sections. The first section asked students to define "service learning" in their own words. The second section asked about motivations for enrolling in the class. As all three classes intended to use intensive group work, the third section asked students about their prior experiences with group work. The fourth section asked a series of questions about perceptions of community involvement and was the longest section of the survey (with 25 questions). Section five asked about how students planned to be involved in community service in the future. Finally, section 6 had an open-ended prompt: "My future career is likely to involve..." There was one additional statement to respond to on

the post survey in section 5: "I will use my experience in this class to help the community." The statistical analysis presented in this paper focuses on sections four and five of the survey; questions from section two are used to help understand the survey population.

Questions in sections four and five of the survey were based upon existing scales that have been developed to assess the effectiveness of service learning (see Bringle et al., 2004 for a comprehensive listing of such scales). Questions in the other sections of the survey were written by the authors. Traditionally scales in surveys consist of a variety of questions that measure one or more underlying constructs (often called subscales). These subscales are not presented to the survey-taker and the questions are usually distributed randomly throughout a question-block so the survey-taker does not know how their responses will be analyzed or grouped.

The majority of the questions for section 4 of the survey were taken from the Community Service Attitudes Scale (CSAS) developed by Shiarella et al. (2000). This scale uses a seven point Likert scale for responses. Bringle et al. (2004) note that "the scale could be used as a moderator, mediating or outcome variable in service learning classes" making it very suitable for our purposes. In the case of the original CSAS scale, there are fifty-four questions and eight subscales (underlying constructs): normative helping attitudes, connectedness, costs, awareness, benefits, seriousness, career benefits and intentions.

To keep our survey a modest length, we used questions from only three of the subscales: normative helping, connectedness and career benefits. The original questions were written with a focus on community development courses and in two cases we needed to modify them to be relevant to natural resource courses. The questions for the Connectedness subscale and the Normative Helping subscale are presented in Tables 1 and 2, respectively. The questions we used for the career benefits subscale are presented in Table 3. The original career benefits subscale used in CSAS only included two questions. For our purposes, we added a question from the benefits subscale and three additional questions. These additional questions were modified from the Community Service Self-Efficacy Scale (CSSES) presented in Reeb et al. (1998). Overall the new career benefits subscale focuses on perceptions of community involvement related to skills or learning that an individual takes away from service to the community. The questions in the CSAS commence with a scenario which also has a community development focus, which we also modified (see Figure 1 for the text and modifications from the original CSAS).

Section 5 of the survey was focused on plans for future community involvement. One of the questions in section 5 of the survey came from the Civic Attitudes and Skills Questionnaire (CASQ) (Moely et al., 2002a, b). The other questions were written by the research team. These questions are presented in Table 4.

Data Analysis Procedures

The three subscales measured in section 4 of the survey (connectedness, normative helping, career benefits) and the future community involvement scale measured in section 5 are each intended to explore a unique dimension, or attitudinal construct, related to overall civic attitudes, skills, or views of community service. This was confirmed by conducting a factor

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Table 1. Perceptions of Community Involvement – Connectedness Subscale

CSAS Sub-Scale Analysis
Factor Analysis: Percent variance explained by Factor 1(pre-test) = 65.0%
Cronbach's Alpha (pre-test) = .921; Cronbach's Alpha (post-test) = .932

1) I am responsible for doing something about improving the community. (.783)
2) It's my responsibility to take some real measures to help others in need. (.869)
3) It is important to me to have a sense of contribution and helpfulness through participating in community service. (.840)
4) It is important to me to have a sense of contribution and helpfulness through participating in community service. (.852)
5) It is important to me to gain an increased sense of responsibility from participating in community service. (.830)
6) I feel an obligation to contribute to the community. (.808)
7) The environment deserves my help. [original question "Other people deserve my help.] (.644)
8) It is critical that citizens become involved in helping their communities. (.806)

Measured using a 7 point response scale from strongly disagree (-3) to strongly agree (+3). (Unrotated factor loadings in parentheses).

Table 2. Perceptions of Community Involvement – Normative Helping

CSAS Sub-Scale Analysis
Factor Analysis: Percent variance explained by Factor 1(pre-test) = 57.4%
Cronbach's Alpha (pre-test) = .919; Cronbach's Alpha (post-test) = .916

1) It is important to help people in general. (.727)
2) Improving communities is important to maintaining a quality society. (.762)
3) I can make a difference in the community. (.786)
4) Our community needs good volunteers. (.748)
5) All communities need good volunteers. (.760)
6) Volunteer work at community agencies helps solve natural resource issues [originally social problems]. (.639)
7) Volunteers in community agencies make a difference, if only a small difference. (.747)
8) College student volunteers can help improve the local community. (.841)
9) Volunteering in community projects can greatly enhance the community's resources. (.716)
10) Contributing my skills will make the community a better place. (.771)
11) My contribution to the community will make a real difference. (.818)

Measured using a 7 point response scale from strongly disagree (-3) to strongly agree (+3). (Unrotated factor loadings in parentheses).

Table 3. Perceptions of Community Involvement – Career Benefits

Factor Analysis: Percent variance explained by Factor 1(pre-test) = 60.7%
Cronbach's Alpha (pre-test) = .869; Cronbach's Alpha (post-test) = .827

1) I would be developing new skills. (.768) [CSAS benefits subscale]
2) I would make valuable contacts for my professional career. (.744) [CSAS career benefits subscale]
3) I would gain valuable experience for my resume. (.755) [CSAS career benefits subscale]
4) I would be able to make a difference in my community. (.797) [CSSES scale]
5) I would be able to interact with relevant professionals in meaningful and effective ways. (.777) [CSSES scale]
6) I would be able to apply knowledge in ways that solve "real-life" problems. (.828) [CSSES scale]

Measured using a 7 point response scale from extremely unlikely (-3) to extremely likely (+3). (Unrotated factor loadings in parentheses).

Table 4. Future Involvement Questions (Survey Section 5).

Factor Analysis: Percent variance explained by Factor 1(pre-test) = 62.5%
Chronbach's Alpha (pre-test) = .840; Chronbach's Alpha (post-test) = .870

1) After graduation, I will look for ways that my educational background can help the community. (.837)
2) My career goals are to help communities improve natural resource issues. (.810)
3) After graduation, I will use my skills to help community projects. (.903)
4) I feel that I am currently prepared to help my community. (.626)
5) After graduation, I plan to become involved in programs to help clean up the environment. (.750) [from CASQ scale with words "after graduation" added]

Measured using a 7 point response scale from strongly disagree (-3) to strongly agree (+3). (Unrotated factor loadings in parentheses).

Figure 1: Introduction to questions contained in Section 4 of survey

This scenario is modified from the original CSAS scenario to better reflect the content of our courses. Our modifications are noted in italics. Note that the final paragraphs appear before the appropriate set of questions.

We are trying to understand your willingness to donate your time regularly to a community service project. *For the purposes of the following questions community service is defined as a project related to natural resources* in which you would volunteer at least twice a month for couple of hours and use your skills and knowledge. In other words, this is more than just volunteering time *pulling up invasives or counting birds once.* These types of community service projects require a long-term commitment (i.e., at least one semester) and offer you the opportunity to share your skills, as well as develop new ones. Examples include *being a Hoosier RiverWatch volunteer, working in a school, development a natural resource management plan for a community, and writing a grant proposal.*

Please answer the following questions about your feelings regarding community service projects using the definition provided previously. Some of the questions might appear similar, but each one measures a unique set of information. If some of the questions do not apply to you, please skip those questions.

Now, pretend you are going to volunteer for a community service project sometime in the next year. Use the following scale to rate how likely you feel *each of the possible outcomes associated with volunteering* are to occur. [before extremely unlikely to extremely likely scale]

Again, pretend you are going to volunteer for community service, described earlier, sometime in the next year. *How strongly do you agree or disagree with each of the following statements about community involvement?* [before strongly disagree to strongly agree scale]

Figure 2. Answers to questions "I enrolled in this class because. . ."; scored on a five point likert scale from strongly disagree (1) to strongly agree (5)
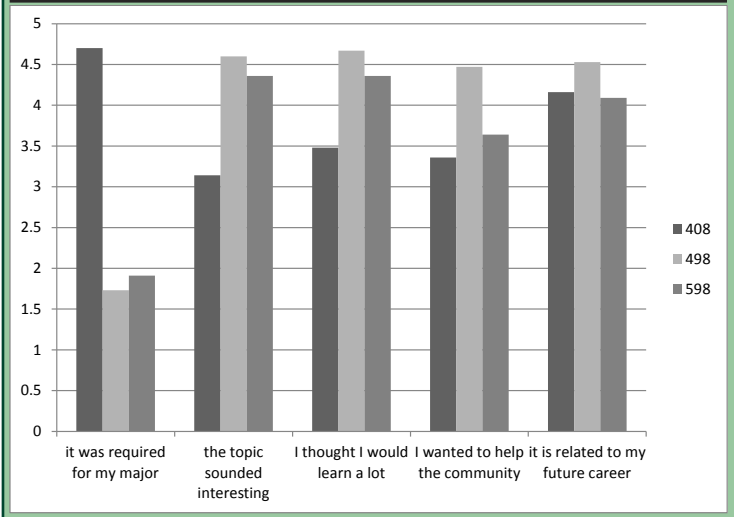
Figure 3. Questions about career aspirations from pre-tests; scored on a seven point likert scale from strongly disagree (1) to strongly agree (7)

analysis for each of the subscales, which showed the presence of a single underlying latent construct for each subscale based on an examination of the scree plots and percent variance explained by the primary factor (for an overview of factor analysis see DeVellis, 2003). The factor loadings for individual items associated with each scale are provided in Tables 1-4. In addition, reliability analysis was conducted and an acceptable Cronbach's alpha score was obtained for each subscale – a score of above 0.70 indicating that each scale is a reliable measure of the latent construct (DeVellis, 2003).

A paired sample t-test was then used to determine if there was a significant difference in the mean score of students' responses to these four scales between the pre- and post-test. The results for each of the paired measures, see Figures 3 through 6, show whether a significant difference in the mean scores for each of the scales exists. These figures also illustrate differences across the courses for the pre-test measures for the scales. An effect size was calculated for each significant difference using the formula $d=t/sqrt(n)$ in order to show the relative strength of the associated change in mean scores between each of the course groups.

Results

Before looking at the service learning specific scales, it is helpful to understand more about the students who

Figure 4. Mean Difference: Connectedness Scale

Post-test	Change in Mean	Sig.	(d)
All Courses	+ 0.31	***	.419
408	+ 0.33	**	.436
498	+ 0.04		n.a.
598	+ 0.66	**	1.26

Sig. & (d) based on paired sample t-test

*=.05, **=.01, ***=.001 probability level

Figure 5. Mean Difference: Normative Helping Scale

Pre-test — CSAS: Normative Helping

Strongly Agree (7) — Strongly Disagree (1)

ALL 5.95 | 408 5.86 | 498 6.21 | 598 5.98

Post-test	Change in Mean	Sig.	(d)
All Courses	+ 0.14	*	.247
408	+ 0.17		n.a.
498	+ 0.03		n.a.
598	+ 0.15		n.a.

Sig. & (d) based on paired sample t-test
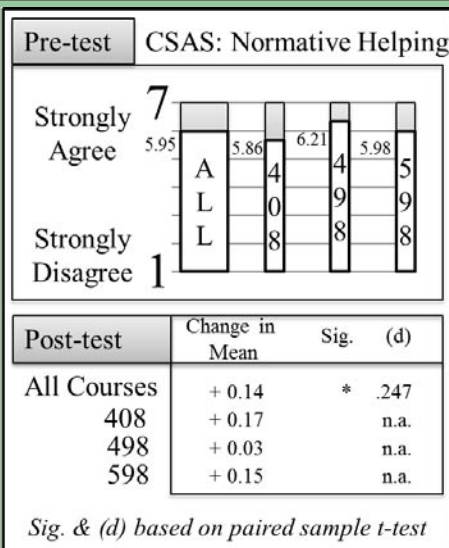
*=.05, **=.01, ***=.001 probability level

Figure 6. Mean Difference: Career Benefit Scale

Pre-test — Career Benefits

Strongly Agree (7) — Strongly Disagree (1)

ALL 6.06 | 408 6.05 | 498 6.29 | 598 5.72

Post-test	Change in Mean	Sig.	(d)
All Courses	+ 0.06		n.a.
408	+ 0.05		n.a.
498	- 0.06		n.a.
598	+ 0.33		n.a.

Sig. & (d) based on paired sample t-test
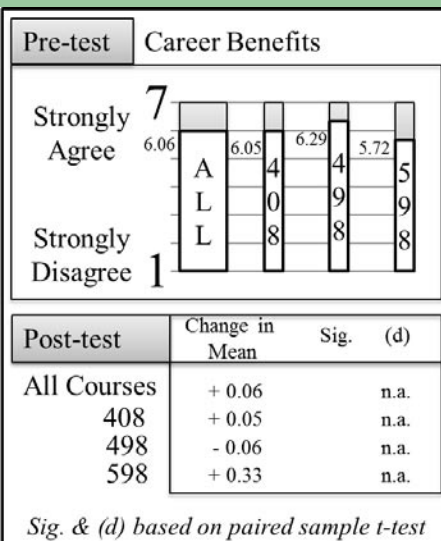
*=.05, **=.01, ***=.001 probability level

Figure 7. Mean Difference: Future Involvement Scale

Pre-test — Future Involvement

Strongly Agree (7) — Strongly Disagree (1)

ALL 5.52 | 408 5.34 | 498 5.95 | 598 5.67

Post-test	Change in Mean	Sig.	(d)
All Courses	+ 0.28	***	.477
408	+ 0.30	**	.452
498	+ 0.29		n.a.
598	+ 0.29		n.a.

Sig. & (d) based on paired sample t-test
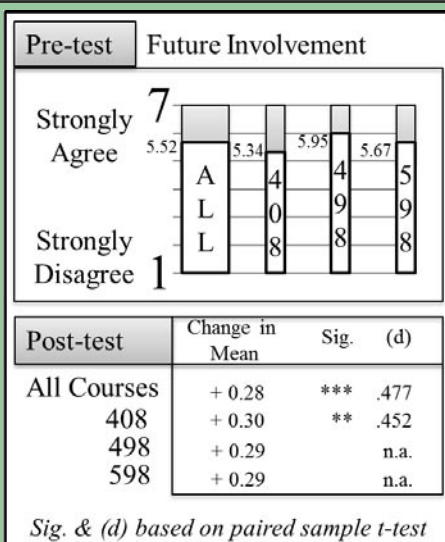
*=.05, **=.01, ***=.001 probability level

enrolled in these courses. As can be seen in Figure 2, enrollment motivations varied across the classes. This is not an unexpected finding due to the varying voluntary nature of these classes. Students in FNR 498, "The Nature of Service Learning", were the most likely to enroll out of a desire to help the community. There was high level of agreement across all the courses in terms of relation of the course to their future careers. Students were most likely to take FNR 408, "Natural Resources Planning", because it was required and to simultaneously think that it was the least interesting sounding class and the class where they would learn the least.

At the beginning of the semester, students enrolled in FNR 498 "The Nature of Service Learning" were the most likely to have career aspirations related to helping communities and natural resource efforts. Students in FNR 598 "Ecological Footprints" were the least likely to consider themselves prepared to help the community. As a mixed graduate/undergraduate class, this possibly reflects the increasing recognition people have as they age about what they do NOT know. Results from some of the questions from section 5 of the survey are presented in Figure 3.

Figure 4 shows that for the combined data set and for 2 of the 3 individual courses, students had a significantly increased sense of responsibility and connectedness to the natural environment at the end of the semester. For FNR 498, there was an increase over time but it was not statistically significant. Note, however, that students in this course started at a much higher level of connectedness than in the other courses and had less room for improvement.

Results for the normative helping scale increased for all groups and increased significantly for the merged sample and FNR 408 showing that perceptions about the importance of helping the community changed over time (see Figure 5). Students in FNR 408 had the lowest scores for normative helping in the baseline survey and subsequently had the most room for improvement.

Interestingly, results for the personal benefits scale only changed significantly for FNR 598 (and showed a negative but insignificant change for FNR 498) (see Figure 6). This scale held together well according to Cronbach's alpha but is a newly constructed scale developed by the authors of this paper and has not been tested in other course settings (unlike the other scales). However according to the results of this study only students in the joint undergraduate/graduate student class significantly changed their opinions about whether they thought that they would personally benefit from future community service work. Students in this course had the lowest scores on the pre-test and so had the most room for improvement.

Finally, Figure 7 shows the results from the future involvement scale. Across all courses and for FNR 408 and FNR 498, students were significantly more likely to think they would work to help the community in the future. This is likely insignificant for FNR 598 only due to a small sample size as the change in the mean is quite

high. This illustrates that these courses had an impact on students' willingness to be "good citizens" in the future.

Discussion and Conclusions

The overwhelming message from this study is that these courses each helped to improve students' experiences and civic mindedness. Despite the fact that motivations for taking each of these classes differed quite a bit, these classes all performed well in terms of the measured outcomes. Also, as hypothesized, there were some differences between the three classes due to different starting levels of the students. Where students already had high values in terms of connectedness and normative helping, statistically significant differences were not observed.

The "career benefits" subscale showed the least change and suggests that these less altruistic concerns were not influenced by participation in these courses with the exception of FNR 598 which had a low baseline score for this subscale.

While originally developed for courses that address social/human issues, the Community Services Attitudes Scale (CSAS) was adapted here to address natural resource focused classes. However, with students who already have a high sense of the importance of community engagement, the subscales do not necessarily work to measure change as it is hard to measure change when baseline attitudes score highly. Therefore it is not possible to know if change even occurred.

Educators interested in producing graduates who will feel a sense of responsibility towards the community and will be willing to use their skills to help improve natural resources should consider service learning as a pedagogical tool to help accomplish these goals. As noted in Tedesco and Salazar's (2006) assessment of their service learning experience in Indianapolis, students realize they can make a positive difference in the community through a service learning course. Educators interested in evaluating the impact of their service learning courses can use the scales presented in this paper unless they think their students will have high scores at the beginning of the semester.

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Perceptions of Food Safety Careers among High School and Community College Students in Rural North Carolina[1]

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Abstract

There is a significant need to recruit students into careers in the food industry, as it is experiencing a shortage of qualified food safety (FS) professionals. Despite the need for FS recruitment, there is scarce research on young people's perceptions of FS careers. This study investigated factors influencing students' choice of career fields and college majors among a convenience sample of 111 high school (HS) students and 24 community college (CC) students in rural Sampson County, North Carolina. When asked whether they had considered a career in FS, a greater percentage of CC students said yes than HS students (33% vs. 14%). Only 10% of minority students considered FS careers. Whereas 67% of all HS and CC students that there were either some or many careers in general, only 40% of them thought these careers were available in their hometown. "Salary and benefits" and "having an employer who believes in me and my ability to contribute" were consistently rated higher than the remaining factors in choosing a career by both HS and CC students, compared to factors such as performing work that is important to society. These findings provide valuable data to inform future recruitment efforts. Next steps for evaluating the effectiveness of FS recruitment campaigns are provided.

Introduction

The transformation of agriculture during the 20th century brought about a period of economic growth and increased efficiency in food production (Dimitri et al., 2005). During this time, there was a decline in the number of people residing and working on farms within the U.S. population. Less than 1% of the U.S. labor force currently works in agriculture, with less than a fourth of the U.S. population residing in rural areas (USDA ERS, 2013). Academic institutions are faced with a declining interest among students in agriculture studies (National Research Council, 2009). The Report to the President on Agricultural Preparedness and the Agriculture Research Enterprise published by the President's Council of Advisors on Science and Technology (2012) recently highlighted the need to attract students to careers in agriculture, stating that many students within natural sciences do not have a positive viewpoint of agriculture-related careers and many of these students do not consider careers in agriculture. This affects the supply of educated, well-trained students entering the agricultural workforce.

Food safety is one of five priority areas that the National Institute of Food and Agriculture identified in 2012 as critical for solving tomorrow's societal problems due to heightened awareness of the economic and health consequences of foodborne illness. There are not enough college students choosing food safety as their field of study and career, as there is a looming shortage of qualified food safety professionals across the entire food industry (Freudenheim 2009; Scott-Thomas 2012). According to the National Research Council (2009), higher education institutions must actively recruit, develop and cultivate the next generation of food safety professionals as employers expect to be able to hire employment-ready graduates from colleges and universities. Effective recruiting from both community colleges and high schools into food safety academic programs is essential for maintaining a steady pipeline of employment-ready graduates.

Community colleges are ideal institutions for recruiting purposes as they represent the largest

postsecondary education sector in the U.S. Currently there is an increasing rate of high school graduates enrolling in community colleges instead of four-year institutions. Nearly half of all U.S. undergraduates are enrolled in community colleges (National Student Clearinghouse, 2012). In North Carolina (NC), 39% of those who graduated with a bachelor's degree included community college as part of their educational path (North Carolina Community Colleges, 2012). It is important that community colleges and universities collaborate to increase transfer rates and validate the community college as an important path to a four-year degree (Kisker, 2007; National Research Council, 2009).

North Carolina is a major contributor to agricultural production, ranking within the top three in the nation for production of swine and turkeys and fifth in the production of broilers (NCDA, 2011). Sampson County is the ideal setting for food safety workforce development efforts because of its economic and demographic profiles and its proximity to several large food-processing companies. The North Carolina Rural Center (2012) provided statistics that highlight Sampson County as a prime place to focus on workforce development. Almost 20% of North Carolina's agricultural production comes from Sampson County and neighboring Duplin County and more than one fourth of all livestock receipts in North Carolina come from these two counties (North Carolina Rural Center, 2012).

Sampson Community College (SCC) is in close proximity to several large food-processing companies. For example, Butterball LLC, House of Raeford, Rose Hill, Prestage Foods and two Smithfield Foods processing facilities are all within 25 miles of the SCC campus. SCC's enrollment and achievement statistics are in line with state CC averages; however the number of professionals with a bachelor's degree or higher in Sampson County is significantly lower than all other counties combined. The SCC Animal Science and Industrial Systems Technology Departments work closely with the local food industry, with about 90 and 50% of their students, respectively, entering the food industry upon graduation. Currently SCC does not have a food safety program; however its administration has discussed establishing a collaborative program with North Carolina State University (NCSU). A collaborative food safety program could provide the food industry with a workforce of trained food safety professionals, bringing a positive impact to the surrounding communities. The success of a joint food safety program between SCC and NCSU would depend upon student enrollment.

The purpose of this study was to gather data relevant to recruitment efforts for college programs and careers in food safety. Specific objectives included gathering information from both Sampson County HS students and CC students to assess (1) the awareness of safety careers; (2) perceptions of the availability of careers in food safety; and (3) the factors that influence the targeted students' career choices.

Methods

The research approach in this study targeted a defined population using a cross-sectional survey to produce descriptive results. The North Carolina State University Institutional Review Board approved the study protocol and all participants provided written informed consent prior to participation in the study.

High school students (n=111) from five schools in Sampson County were surveyed while visiting SCC for a campus-wide career day. The HS students completed a pencil and paper version of the survey as part of a tour of SCC. Additionally, CC students enrolled in the Animal Science Curriculum at SCC (n=24) completed an online version of the same survey as an activity in a 200-level animal science class. Survey respondents' demographics are provided in Table 1.

Table 1. Demographics of survey respondents in the present study.		
	High School (n=111)	**Community College** (n=24)
Gender		
Male	79%	67%
Female	21%	33%
Ethnicity		
Caucasian	67%	79%
African American	9%	13%
Hispanic	19%	4%
Asian	0%	4%
Native American	2%	0%
Pacific Islander	1%	0%
Other	2%	0%
Average Age	18	23

Researchers at NCSU and SCC developed questions about careers in food safety factors that may affect students' career choices. These were composed online using Qualtrics (Provo, UT) and included the following:

1. "Have you considered a career within the food industry?"
2. "Have you ever worked in the food industry?"
3. "How available do you think careers in food safety are in general?"
4. "How available do you think careers in food safety are specifically in your hometown?"
5. "How important are the following factors in your selection of a career?"

Each question provided participants with a five-point Likert scale to indicate their responses, with exception to the first and second questions, which simply asked for a yes or no. Likert scales ranged from "many available" to "none" in questions three and four and from "very important" to "not important at all" in the fifth question. These Likert scales were converted to quantitative scores, ranging from 0 for "none" and "not at all important" up to 5 for "many available" and "very important." Survey participants were asked about eight factors in the fifth question: salary and benefits, my employer pays for my benefits, my workplace is close to home, opportunity for career promotion, performing work that is important to society, having an employer that believes in me, flexible work hours and travel opportunities. Statistical analyses

were performed using a software package (SAS, SAS Institute, Cary, NC). Pearson correlations were evaluated and a 95% confidence interval was evaluated using t-test and one-way ANOVA hypothesis testing.

Results and Discussion

Have You Considered a Career within the Industry?

Participants were asked whether they had considered a career in the food industry. Approximately 33% and 14% of CC and HS students, respectively, said they had considered careers in the food industry (Figure 1). In a related study Wachenheim and Beauchamp (2013) measured interests in food safety careers among undergraduate students in an introductory microeconomics course. Half of their students expressed no interest, and the remaining students were evenly split between expressing interest and being neutral. There is opportunity to increase these numbers through well-designed recruitment efforts. In this regard, Wachenheim and Beauchamp (2013) stated there is a need to inform students about what food safety professions entail, as many students' perceptions of food safety professions are flawed. It was unclear what specific food safety professions the students in the present study have considered.

Figure 1.

Percentage of CC (bottom), HS (middle) and all (top) students who answered yes to the question, "Have you ever considered a career in the food industry?" Letters represent significant difference between relative percentages of CC and HS students.
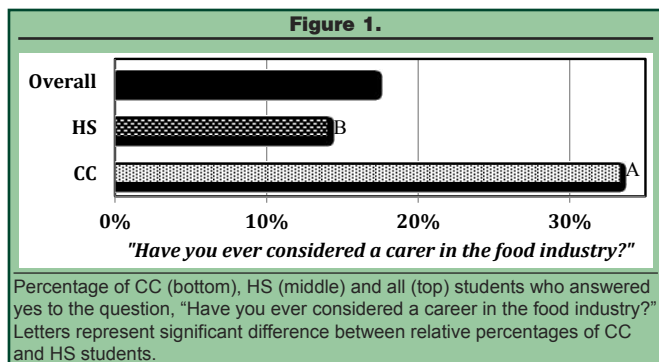
Relatively more CC students have considered careers in the food industry than HS students ($p < 0.05$; Fig. 1). This result could be explained by the age difference between HS and CC students. The average ages of HS and CC students were 18 and 23, respectively. Esters (2007) reported that freshmen in an agricultural and life science college had higher levels of indecision while choosing careers than college seniors. It is probable that CC students devoted more consideration to their career choices than HS students because of their higher levels of maturity and/or they felt more pressure to establish a career path. This explanation remains to be corroborated by other studies of young peoples' career choices however.

Approximately 9% of minorities indicated they have considered careers in the industry, compared to 19% of non-minority students (data not shown). Thus, a significantly lower proportion of minorities considered careers in the food industry than non-minority students ($p < 0.05$). Approximately 12-13% of male HS, female HS

and female CC students indicated they have considered careers in the food industry, which was significantly less than male CC students ($p < 0.05$), in which case 44% of these students have considered these careers. Recruitment efforts should focus on underrepresented minority and female populations. Previous studies have suggested minorities have negative feelings associated with agricultural careers (Scanlon et al., 1989; Wiley et al., 1995). Wiley et al. (1995) suggested this is partly explained by minorities not realizing agricultural majors encompasses more than only farming. This problem is especially significant in Sampson County, where the Hispanic and African American population proportion is twice as high as all NC rural counties and all NC counties combined (North Carolina Rural Center, 2012). Ma (2011) suggested promotional materials used to describe a career field should involve representation of diverse groups of professionals currently employed in that job sector.

Have You Ever Worked in the Food Industry?

In the present study, 19% of HS students and 46% of CC students said they had worked in the food industry before (data not shown). Overall, these students were 2.2 times more likely to consider a career in food safety than students who have not worked in the food industry before (Figure 2). These results suggest recruitment efforts specifically targeted at students with food industry work experience could be more effective than those aimed at students in general. Workers who have relevant previous training need less training and have greater productivity than workers with no experience in the industry (Bishop, 1994). Therefore, specialized recruitment efforts aimed at students with previous work experience would reach a significant audience (approximately 20% and 50% of students in the present study) and improve the efficiency of workforce capacity building.

Figure 2.

Proportion of students who responded, "yes" to the question "Have you considered a career in the food industry?" (n=25). Letters indicate significant difference ($p < 0.05$).
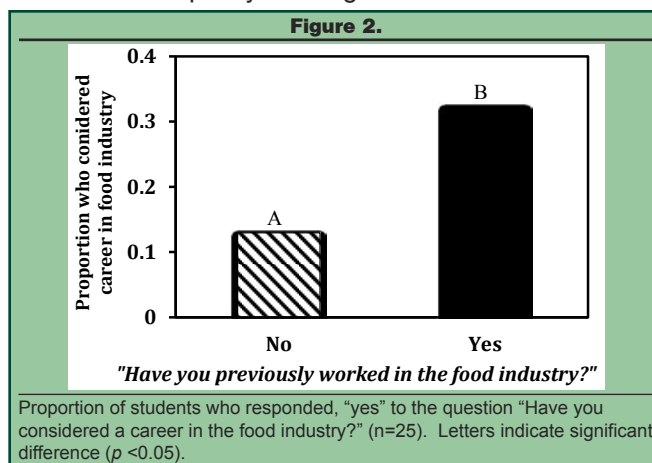
How Available do You Think Careers in Food Safety are in General? How about the Availability of these Careers in Your Hometown?

Approximately 67% of all students thought there were either many or some FS careers available in general, and this result was similar for CC and HS students (Figure

3). This result was promising, as students' perceptions appeared to be accurate. Indeed many FS careers are available, for example, in 2010 there were 33,500 agriculture and food scientist jobs, 13,900 of which were specifically food scientist/technologist jobs on the market (Bureau of Labor Statistics, 2010). There were also 46,360 first-line production supervisor/manager jobs available. The agriculture and food scientists jobs market is expected to increase by 10% throughout the next 10 years (Bureau of Labor Statistics, 2010). Both HS and CC students' perceptions of the availability of FS careers specifically in their hometown was significantly lower than that of these careers in general. Only 40% of all students thought there were either many or some FS careers available (Figure 3), which was significantly less than their perceptions of these careers when location was not specified to their hometown ($p < 0.05$). These data suggest students think there are fewer careers in their hometown than there are nationally. The accuracy of students' perceptions of local food career availability question is arguable. Sampson County is home to several large food-processing companies and it is well known that most of these have been recruiting FS professionals for many years. However, compared to areas outside of Sampson County, of course there are more careers available worldwide.

Figure 3.

☒ Some or Many   ☒ Few   ■ None or Scarce

"How available do you think that food safety careers in general (or in your hometown) are?"

Perceptions of the availability of food safety careers in general (bottom bar) and specifically in the hometowns (top bar) among community college and high school students.
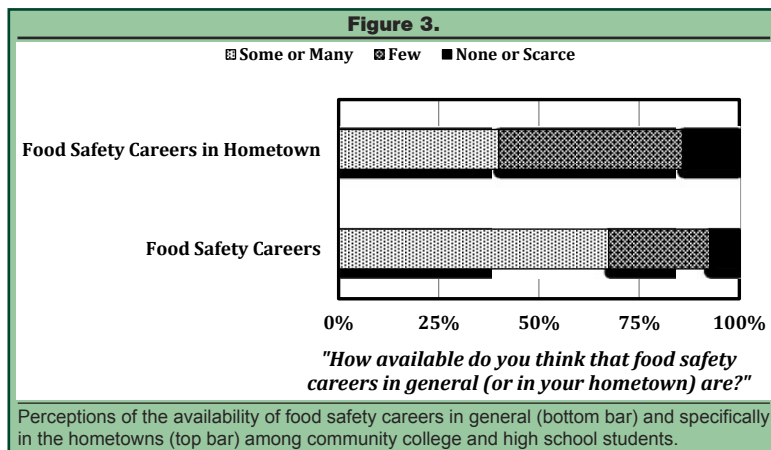
It was hypothesized that students' perceptions of the availability of FS careers would positively influence their interests in these careers. However, there was no significant correlation between students responses to these two questions ($p > 0.05$; data not shown). Thus, recruitment efforts aimed at students of this target audience should communicate more than the availability of jobs, as it appeared that other factors influenced students' interests in these careers.

How Important are the Following Factors in Your Selection of a Career?

"Salary and benefits" and "having an employer who believes in me" were ranked as the top two important factors for both HS and CC students' selections of career fields (Table 2). While "Opportunities for career promotion" ranked as the third most important factor for both groups, it was of equal importance to CC students

as the top two factors but less important than these factors to the HS students ($p < 0.05$). Nonetheless, CC and HS students held similar views of what factors are most important in their choices of careers.

It has been reported that the majority of students choose a major based on whether that field of study matches their interests and abilities, as opposed to several other factors, such as importance to societal problems, potential for career advancement and financial reasons (Malgwi et al., 2005; Beggs et al., 2008). However, the present study suggested the contrary. For example "salary and benefits" was significantly more important than "performing work that is important to society" ($p < 0.05$). This discrepancy could be due to demographic differences (e.g. location or socioeconomic status) between the students of Sampson County and students those studied in previous research. It is also likely that factors such as "salary and benefits" and "opportunity for career promotion" have become more important to today's students in college, since the U.S. economy's Financial Crisis of 2007-2008 has significantly impacted students' perceived economic stress levels (Guo et al., 2011).

Social and economic factors probably had a significant effect on the results in the present study. A study by Ferry (2006) utilized focus groups to examine factors influencing career choices among three groups, which included graduating high school seniors, college seniors and employed young adults. Results indicated that communities of more affluence appeared to offer youth more school and family support in career exploration, which resulted in understanding and consideration of a broader range of career options than those youth in limited socio-economic communities. Furthermore, the study showed a wide range of "career choice maturity." Students from the lower-income schools indicated they were more likely to have not decided on a career, whereas students from affluent schools were more likely to attend college or alternative advanced training. SCC serves a county that exceeds most measures of poverty (e.g. poverty rate, child poverty rate and elderly poverty rate) when compared to state and rural county averages. The average household in Sampson County is approximately $6,000-9,000 less than the state average and approximately $3,000-6,000 less than all rural NC counties combined. Thus, this study underscores a crucial opportunity in not only educating our future workforce of the many food safety careers, but a critical prospect in breaking an economically challenged cycle among young adults.

Limitations

While the use of survey research offers a timely and straightforward approach to understanding real world observations at a low cost, the authors acknowledge the results of this study may not be generalizable to all HS and CC students. The authors chose to utilize

convenience sampling, however convenience sampling does not result in representative results and may be difficult to replicate among other populations. In spite of these limitations, this study serves as a catalyst for future studies regarding the current needs of recruiting students in food safety academic programs and careers, especially those specifically in Sampson County, NC.

Recommendations for Future Work

To build upon this empirical study, future studies should be constructed within a social science framework. For example, Social Cognitive Career Theory (SCCT) was developed to explain processes of developing career interests, making career choices and achieving career success (Greenhaus and Callanan, 2007). These events are theoretically dependent on three interdependent variables: self-efficacy, outcome expectations and goals. According to SCCT, the messages in recruitment communications should emphasize tasks and abilities required in FS careers so students have an opportunity to consider their self-efficacy in these activities. For example, management careers in food processing plants demand leadership skills and the majority of food safety science careers require scientific skills and knowledge in microbiology. Recruitment messages should also emphasize outcomes of FS careers so students may determine whether these satisfy their expectations and interests, e.g. salary and benefits seemed to be a key motivator in the present study. Other outcomes that could be communicated include developing technology solutions for reducing food safety risks, educating or training audiences on food safety, or minimizing the spread of foodborne illness through surveillance methods. In theory, students formulate personal goals for career achievement in food safety if they connect with these self-efficacy and outcome messages.

Future studies should also consider adopting formalized instruments for assessing students' career decision-making process. The Career Decision Scale (CDS) was developed to identify individuals' barriers in making career decisions (Osipow, 1987) and this instrument has stimulated significant research activity since it was first introduced. Similarly, the Career Factors Inventory (CFI) measures four components related to problems individuals face as they experience career indecision (Chartrand et al., 1990), the Career Decision-Making Difficulties Questionnaire measures levels of career indecision and identify contributing factors (Gati et al., 1996) and the Career Decision-Making Self Efficacy assesses self-efficacy expectations in career decision-making (Taylor and Betz, 1983). Applications of these instruments, within the confines of a framework such as SCCT, would improve the insights gained in future studies.

Summary

This study provided data relevant to developing collaborative recruitment programs between SCC and NCSU in improving the food safety workforce capacity. This partnership opportunity requires special attention to both underrepresented minorities and students from communities in poverty. Overall, students seemed aware of the many careers available in this field; however underrepresented minorities indicated the lowest interest levels in food safety careers. Students with previous work experiences in the food industry had higher interest levels, thus targeting these students could enhance effectiveness of recruitment campaigns. Top factors influencing all students' career choices were identified as salary, benefits, having a caring employer and opportunity for career promotion. Future research should employ social science frameworks and employ standardized instruments aimed at determining best practices for recruiting specific populations. These include underrepresented minorities and women, as these groups were least interested in FS careers, and also students with previous work experiences in the food industry because they appeared to be the most likely to choose careers in food safety.

Table 2. Top factors affecting HS and CC students' choice of careers, ranked in order of importance. Superscript letters indicate significant differences within each grouping.

High School		Community College		Overall (Both)	
Factor	**Mean**	**Factor**	**Mean**	**Factor**	**Mean**
1. "Salary and benefits"	4.26[A]	1. "Having an employer who believes in me"	4.26[A]	1. "Salary and benefits"	4.24[A]
2. "Having an employer who believes in me"	3.99[AB]	2. "Salary and benefits"	4.16[A]	2. "Having an employer who believes in me"	4.07[AB]
3. "Opportunities for career promotion"	3.97[B]	3. "Opportunities for career promotion"	4.13[AB]	3. "Opportunities for career promotion"	4.01[B]
4. "Flexible work hours"	3.86[BC]	4. " Flexible work hours"	4.13[AB]	4. " Flexible work hours"	3.94[B]
5. "Performing work that is important to society"	3.64[CD]	5. "Performing work that is important to society"	3.96[ABC]	5. "Performing work that is important to society"	3.73[C]
6. "Travel Opportunities"	3.59[DE]	6. "My workplace is close to home"	3.91[ABC]	6. "My workplace is close to home"	3.59[CD]
7. "My workplace is close to home"	3.47[DE]	7. "My employer pays for my education"	3.61[BC]	7. "Travel Opportunities"	3.57[CD]
8. "My employer pays for my education"	3.31[E]	8. "Travel Opportunities"	3.50[C]	8. "My employer pays for my education"	3.40[D]

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An Analysis of a High-Impact Field Experience in Agriculture: Documenting Critical Thinking Skills through Reflection

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Abstract

This study sought to describe the critical thinking levels of students enrolled in an agriculture course at Texas A&M University that included a high-impact, domestic, experiential learning trip. Articulated learning statements of 25 undergraduate students enrolled in the course were reviewed using the DEAL Model critical thinking rubric to assess students' levels of critical thinking. Students completed articulated learning statements in three categories: personal growth, academic enhancement and civic learning. Eleven standards were used to measure critical thinking: integration, relevance, accuracy, clarity, precision, writing, depth, breadth, logic, significance and fairness. Students' critical thinking scores were considered good in the learning categories of academic enhancement and personal growth. In the learning category of civic learning, students' critical thinking scores were considered slightly under-developed. In regard to the specific standards through which critical thinking was measured, writing was consistent as being one of the highest standards for each learning category. Student scores on the significance standard were considered good for the academic enhancement and personal growth learning categories, but were considered slightly underdeveloped for the civic learning category.

Introduction

A challenge faced by personnel in higher education is how to help the nation's diverse students reap the full benefits of a college education and be prepared for the workforce (Casner-Lotto and Barrington, 2006; Kuh, 2008). The measure of success for college students has shifted from simply earning a degree to learning essential skills that will allow them to be successful in terms of thriving in highly demanding contexts after graduation.

A key learning outcome for students in higher education is the ability to think critically across the curriculum (Kronholm, 1996; Tsui, 2002; AACU, 2004). Ironically, critical thinking is a skill purported by many to be deficient in college students, including students in colleges of agriculture (Flores et al., 2010; Jones and Merritt, 1999; Keeley et al., 1982; Rudd et al., 2000; Zascavage et al., 2007). Some researchers and educators have even placed critical thinking as one of the highest priorities in a college education (Halonen and Gray, 2001). Employers have recognized the need for critical thinking skills development in future programs focused on agriculture and natural resources education for a global economy (National Research Council, 2009; Scanlon et al., 1996). Quinn et al. (2009) contended critical thinking skills are essential to natural resource and agriculture students who will be decision-makers faced with ethical, political and economic implications.

One way colleges have sought to meet the challenge of preparing college graduates for essential learning outcomes is through the offering of high-impact learning experiences. High-impact learning experiences have been identified as those experiences that lead to increased student engagement and, thus, deeper learning in college courses (Kuh, 2008). Researchers have suggested several practices lead to increased rates of student retention and student engagement, including first-year seminars and experiences, common intellectual experiences, learning communities, writing-intensive courses, collaborative assignments and projects, undergraduate research, diversity/global learning, service learning and community-based learning, internships and capstone courses and projects (Kuh, 2008). Because high-impact field experiences have the potential to "help students explore cultures,

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life experiences and worldviews different than their own" (Kuh, 2008, p. 9), they fall under the high-impact practice of diversity/global learning. High-impact field experiences can also be classified as service learning when such is incorporated into the experience.

Journal writing and self-reflection can increase depth of learning and critical thinking (Jones and Brown, 1993; Lizzio and Wilson, 2007; Sessa et al., 2009). A study by Burbach et al. (2004) identified that active learning techniques such as instructor-mediated reaction journals, student presentations and class discussion lead to increased critical thinking. Although some teaching and learning practices have been evaluated and shown to be beneficial for college students of many backgrounds (Kuh, 2008), more intentional practices connected to essential learning outcomes need to be developed (Kuh, 2008). Reflection can be a powerful mechanism to document students' ideas on what they are learning in a course (McClam et al., 2008; Sessa et al., 2009). Reflection can also be used to document the depth of student learning and their critical thinking level about this learning (Molee et al., 2010).

Field experiences fit the definition of a high-impact practice, but assessment of this practice is needed to document and create clear connections between the intended learning outcomes and this specific practice (Kuh, 2008). This study's high-impact practice used reflection to document the critical thinking ability of students. This study sought to describe and assess through reflection the critical thinking of students enrolled in an agricultural course at Texas A&M University that included a domestic field experience.

Experiential Learning

Experiential learning is a foundational practice in agricultural education (Baker et al., 2012). Experiential learning often includes service-learning, field trips, supervised agricultural experiences, or project based learning. In each of these areas, reflection is central to guide student learning. Dewey (1989), often cited as the founder of experiential education, emphasized the importance of learning from an experience rather than completing the experience and never revisiting the learning that took place. The key to learning from experience is identifying opportunities for reflection so that one may discover new ideas. Some scholars believe that reflection can be "associated with 'touchy-feely' introspection, too subjective to evaluate in a meaningful way and lacking in the rigor required for substantive academic work" (Ash and Clayton, 2009a, p. 27). In reality, if structured well, reflection should be "a process of metacognition that functions to improve the quality of thought and of action and the relationship between them" (Ash and Clayton, 2009a, p. 27).

DEAL Model

The DEAL (Describe, Examine and Articulate Learning) model has been used as an effective assessment measure of student learning through reflection in service-learning courses (Molee et al., 2010). In the study conducted by Molee et al. (2010), student reflections were examined two times throughout the service-learning experience to assess depth of learning and levels of critical thinking in freshmen and upperclassmen college students.

Based on the taxonomy of educational objectives (Bloom et al., 1956) and Paul and Elder's (2002) Critical thinking: Tools for taking charge of your professional and personal life, the DEAL model was initially created to help students reflect on their service-learning experiences. The DEAL model has been commonly used in traditional and experiential pedagogies, including K-12, undergraduate and graduate courses and professional training settings (Ash and Clayton, 2009a). Ash and Clayton published their model in applied or experiential learning arenas, emphasizing the flexible nature of this reflection tool (Ash and Clayton, 2009a; Ash and Clayton, 2004). The DEAL model consists of three steps used to guide and structure student reflections about an experience.

The Describe step may appear to be a simple way for students to document their observations, but students often start with interpretation before analyzing what actually occurred in an experience. The describe step helps students in reflecting on the facts before making assumptions by enabling students to address where and when the experience occurred, who was involved, what actions (or lack thereof) took place and what they observed and heard (Ash and Clayton, 2009a). Further, the describe step may look different depending on how the instructor designs the questions. Students could reflect continuously over the course of an experience or it may be an oral exercise done in groups within the classroom setting (Ash and Clayton, 2009b).

The Examine step guides students in expressing their learning in relation to the desired learning outcomes of the experience. Learning outcomes are categorized within three categories, civic, personal and academic learning. The intent is for the examine step to "stimulate questions or surface issues for further discussion rather than to evaluate students' reasoning" (Ash and Clayton, 2009a, p. 42). The first four levels of the taxonomy of educational objectives are addressed in the examine step: identification, explanation, application and analysis (Ash and Clayton, 2009b; Bloom et al., 1956).

In the Articulated Learning step, students move to synthesis and evaluation within the taxonomy of educational objectives (Bloom et al., 1956). Articulated learning statements are developed where students will deepen their learning by "re-considering and re-framing it in the context of four final questions" (Ash and Clayton, 2009b, p. 4-7): What did I learn? How did I learn it? Why does this learning matter? What will/could I or others do in light of this learning? This step allows students to rethink or extend their thinking from the previous step (Ash and Clayton, 2009b, p. 4-7). Articulated learning encourages students to provide specific evidence of their experiences to back up their arguments. Furthermore, it asks students to "find significance in your learning" (Ash and

Clayton, 2009b, p. 4-8). Articulated learning also helps students to identify action steps that should be conducted based on the learning identified.

Ash and Clayton (2004) shared "*the ultimate goal of reflection is to help students explore and express what they are learning through their [service] experiences so that both the learning and the [service] are enhanced*" (p. 139). Articulated learning statements allow the instructor to give credit for the learning that took place not just the experience (Walker, 1990).

The DEAL model for critical reflection examines learning in three categories, which are considered as learning outcomes for the experiences: personal growth, civic learning and academic enhancement. These three categories of learning allow students to purposefully consider their learning outcomes outside the context of the experience. In the category of personal growth, reflection is focused on who an individual is including his or her strengths, weaknesses, assumptions, skills and convictions and who he or she wants to be both personally and professionally. Civic learning reflection is focused on how groups, including individuals, organizations and policies work together to accomplish common goals. Through reflection on civic learning, students examine roles and approaches to change and how this plays out in different situations. Reflection in the category of academic enhancement involves applying what students have learned in their courses to service-related activities to synthesize and develop greater understanding of the academic material.

Purpose and Objectives

The purpose of this study was to describe critical thinking levels of students enrolled in an agricultural course at Texas A&M University that included a domestic experiential learning trip, considered a high-impact experience. The specific research question guiding this study was: What was the level of critical thinking students achieved as measured by the DEAL model through an experiential learning trip?

This study was guided by three research objectives:
1. Describe students' level of critical thinking on academic enhancement as measured by the DEAL model critical thinking rubric;
2. Describe students' level of critical thinking on personal growth as measured by the DEAL model critical thinking rubric; and
3. Describe students' level of critical thinking on civic learning as measured by the DEAL model critical thinking rubric.

Methods

Subjects included in this study were students enrolled in an agriculture course incorporating a domestic experiential learning trip at Texas A&M University during the fall semester of 2012. During the first eight weeks of the semester, students met once per week for lecture and discussion. The 10-day field experience component of the course occurred during weeks nine and 10. Students

travelled via charter bus to various destinations in the Midwestern US: The stop in Joplin, Missouri included a service learning activity to help the tornado-damaged community of Joplin with home repairs. Another part of the trip involved students providing service to various CDEs at the National FFA Convention in Indianapolis, Indiana. Additionally, the field experience integrated tours of the Caterpillar Plant, an Amish community in Central Missouri, the Wild Turkey Distillery and Churchill Downs. During weeks 11 through 15, students met once per week for discussion related to the experiences during the field experience.

A total of 42 students were enrolled in the course; the accessible population included 25 students who completed and submitted usable articulated learning statements for each of the three areas: academic enhancement, civic learning and personal development. Among the students included in this study, four were male and 21 were female; 25 were Caucasian, of which five were Hispanic; students ranged in age from 18 to 30 years, with grade-point-averages that ranged from 2.3 to 4.0 on a four-point grade scale.

The Institutional Review Board at Texas A&M University approved the study protocol (Protocol Number: 2011-0894). This study was not exempt, but a waiver of written consent was obtained. Students received study information in the course syllabus and it was explained the first day of class. As a part of the course, students submitted reflections and blogs throughout the semester. An overview of the DEAL model was presented to students during a class lecture and provided guidance in applying this model throughout the semester. Prior to submitting written reflections and blogs each day during the field trip, students were assembled into nightly discussion groups facilitated by a discussion leader (faculty or graduate student). Students were engaged in the describe and examine steps of the DEAL model as they reflected and discussed with their small group and facilitator what they experienced that day and questions that surfaced about that experience. Students were then encouraged individually to describe what they experienced and to surface issues of the experience (examine) by completing their written blogs and reflections. The written blogs and reflections were a requirement of the field trip.

At the end of the semester, students reflected on the entire semester and completed articulated learning statements in three categories: academic enhancement, civic learning and personal development. Students' articulated learning statements were approximately one page for each learning category and addressed the following questions: What did I learn? How did I learn it? Why does this learning matter? and What will I do in light of this learning? Students' articulated learning statements served as the data in this study and were analyzed using The DEAL model critical thinking rubric (Ash et al., 2005). The rubric included 11 standards of critical thinking: integration, relevance, accuracy, clarity, precision, writing, depth, breadth, logic, significance and

Table 1. Standards of Critical Thinking

Standard	Guiding Question(s)
Integration	Are all of your statements relevant to the specific category of learning goal being discussed?
Clarity	Do you expand on ideas, express ideas in another way, provide examples or illustrations where appropriate?
Accuracy	Are all of your statements, is all of your information, factually correct and/or supported with evidence?
Precision	Do all of your statements or claims contain specific information, descriptions, or data?
Relevance	Are all of your statements relevant to the question at hand? Does what you're saying connect to your central point?
Depth	Do you explain the reasons behind your conclusions, anticipate and answer the question that your reasoning raises and/or acknowledge the complexity of the issue?
Breadth	Are you considering alternative points of view? Have you thought about how someone else might have interpreted the situation?
Logic	Does your line of reasoning make sense? Does it follow from the facts and/or what you said?
Significance	Do your conclusions or goals represent a (the) major issue raised by your reflection on experience?
Fairness	Do you represent perspectives other than your own integrity (without bias or distortion)?
Writing	Is your writing free of typographical, spelling, and grammatical errors?

Table 2. Students' Critical Thinking Scores for Academic Enhancement Category (N=25)

Standard of Critical thinking	Min Score	Max Score	μ	σ
Fairness	3	4	3.68	.476
Writing	2	4	3.64	.638
Precision	2	4	3.44	.651
Clarity	2	4	3.40	.645
Integration	2	4	3.36	.638
Breadth	2	4	3.36	.700
Relevance	2	4	3.24	.663
Logic	2	4	3.24	.597
Accuracy	2	4	3.20	.645
Depth	2	4	3.20	.707
Significance	2	4	3.08	.702
Grand Mean			**3.36**	**.533**

Note. 1 = completely lacking; 2 = under-developed; 3 = good; 4 = excellent

Table 3. Students' Critical Thinking Scores for Civic Learning Category (N=25)

Standard of Critical Thinking	Min Score	Max Score	μ	σ
Writing	3	4	3.56	.507
Fairness	2	4	3.20	.577
Precision	2	4	3.00	.408
Clarity	2	4	2.96	.539
Breadth	2	4	2.96	.611
Integration	2	4	2.80	.816
Accuracy	2	4	2.80	.577
Logic	2	4	2.72	.542
Depth	2	4	2.64	.638
Relevance	1	4	2.56	.821
Significance	2	4	2.56	.583
Grand Mean			**2.90**	**.450**

Note. 1 = completely lacking; 2 = under-developed; 3 = good; 4 = excellent

fairness (see Table 1). Nine of the 11 standards of critical thinking, except integration and writing, were described by Paul and Elder (2001) as universal intellectual standards. *"Universal intellectual standards are standards which must be applied to thinking whenever one is interested in checking the quality of reasoning about a problem, issue, or situation"* (Paul and Elder, 2001, p. 7). Ash and Clayton (2009b) added integration as a service-learning specific "standard" and "quality of writing" as a criteria, in acknowledgement of our conviction that careful thinking is closely linked to careful writing (Ash and Clayton, 2009b, p. 3-ii).

Three coders used the DEAL model depth of learning and critical thinking rubrics, (Ash et al., 2005) to assess the quality of student thinking, based on the elements of critical thinking within each of the three areas. One of the coders was not involved in the delivery of the course and did not participate in the experiential learning trip portion of the course. Thus, this coder was unfamiliar with specifics related to the course, including course content, and had no interaction with students in the course prior to data collection and analysis. The other two coders participated in the delivery of the course and the experiential learning trip included in the course.

Before independently scoring each articulated learning statement, the coders reviewed the rubric and standards of critical thinking (Ash and Clayton, 2009b). After scoring independently, the coders met to discuss the scores. In instances where scores differed among the coders, the articulated learning statement was reviewed and discussed and an overall score was determined by consensus. This resulted in one overall score for each articulated learning statement within each of the three areas. The resulting scores served as data for this study and were analyzed using IBM® SPSS® Statistics, version 20. Because the findings of this study were not inferential in nature, parameters were reported, rather than statistics.

Results and Discussion

Students' critical thinking scores for the category of academic enhancement were noted in Table 2. Except for fairness, students' academic enhancement scores ranged from two to four for each of the 11 measures of critical thinking; fairness ranged from three to four. Therefore, students' critical thinking scores for academic enhancement reflected ranges of student performance between under-developed and excellent. Five critical thinking measures were less than the academic enhancement grand mean (μ_{AE} = 3.36; σ_{AE} = 0.533); whereas, two measures were equal to the grand mean and four measures exceeded the grand mean. Students scored highest on the fairness (μ = 3.68; σ = 0.476) standard of critical thinking and lowest in the significance (μ = 3.08; σ = 0.702) standard for the academic enhancement category of learning.

Students' critical thinking scores for the category of civic learning were noted in Table 3. Civic learning score ranges varied among the measures; minimum range scores were as small as one and maximum range scores were as large as four. Thus, students' critical thinking scores for civic learning reflected ranges of student performance from completely lacking to excellent. Six critical thinking measures were less than the civic learning grand mean (μ_{CL} = 2.90; σ_{CL} = 0.450); whereas, five measures exceeded the grand mean. Students scored highest on the writing (μ = 3.56; σ = 0.507) standard of critical thinking and were tied between significance (μ = 2.56; σ = .583) and relevance (μ = 2.56; σ = 0.821)

Table 4. Students' Critical Thinking Scores for Personal Growth Category (N=25)				
Standard of Critical Thinking	Min Score	Max Score	μ	σ
Writing	2	4	3.44	.583
Fairness	2	4	3.28	.614
Relevance	2	4	3.08	.640
Significance	2	4	3.08	.572
Logic	2	4	3.04	.539
Clarity	2	4	3.00	.707
Integration	2	4	2.96	.735
Precision	2	4	2.92	.702
Depth	2	3	2.88	.332
Accuracy	2	4	2.84	.688
Breadth	2	3	2.64	.490
Grand Mean			**3.01**	**.393**

Note. 1 = completely lacking; 2 = under-developed; 3 = good; 4 = excellent

Table 5. Students' Critical Thinking Learning Category Sums (N=25)				
Learning Category	Min Score	Max Score	μ_{SUM}	σ_{SUM}
Academic Enhancement	20	36	30.20	4.796
Civic Learning	21	34	26.08	4.051
Personal Growth	20	32	27.12	3.539

Note. Possible range of scores: Minimum = 11; Maximum = 44

for the lowest standard of critical thinking of the civic learning category.

Students' critical thinking scores for the category of personal growth were noted in Table 4. Minimum personal growth range scores were consistent at two; whereas, the maximum range scores were either three or four, depending on the measure. Therefore, students' critical thinking scores for personal growth reflected ranges of student performance between under-developed and excellent. Six critical thinking measures were less than the personal growth grand mean (μPG = 3.01; σPG = 0.393) and five measures exceeded the grand mean. Students scored highest on the writing (μ = 3.44; σ = 0.583) standard of critical thinking and lowest on the precision (μ = 2.92; σ = 0.292) standard for the personal growth category of learning.

Based on grand means for each category, students' scores indicated the highest performance in critical thinking related to academic enhancement (μAE = 3.36; σAE = 0.533), followed by personal development (μPG = 3.01; σPG = 0.393) and then civic learning (μCL = 2.90; σCL = 0.450). The summated minimum, maximum, mean and standard deviation scores for each learning category were presented in Table 5 to serve as a secondary and more finite measure. Although minimum and maximum scores of critical thinking standards on a per-item individual basis ranged from one to four, no individual scored the lowest possible score of 11 or the highest possible score of 44.

Summary

The purpose of this study was to describe and assess, through reflection, the critical thinking levels of students enrolled in an agricultural course at Texas A&M University that included a domestic experiential learning trip. Specific objectives included describing students' level of critical thinking in the learning categories of academic enhancement, personal growth and civic

learning as measured by the DEAL Model Critical Thinking Rubric.

Critical thinking is a skill seen as important for college students to obtain (Kronholm, 1996; Tsui, 2002; AACU, 2004); therefore, a need exists to assess those skills in college students and examine whether they have acquired these skills through their college experiences. This study did not seek to compare the critical thinking abilities of college students, who were involved in different experiences, but simply to describe and document the critical thinking abilities of college students who participated in an agriculture course that included a high-impact domestic experiential learning trip. In this study, the average scores for critical thinking were considered good in the learning categories of academic enhancement (μAE = 3.36; σAE = 0.533) and personal growth (μPG= 3.01; σPG = 0.393). The average scores for critical thinking in the learning category of civic learning would be considered slightly underdeveloped (μCL = 2.90; σCL = 0.450).

In examining the specific critical thinking standards measured by the DEAL model depth of learning and critical thinking rubric, students scored lowest in the significance standard for the learning categories of civic learning (μ = 2.56; σ = 0.583) and academic enhancement (μ = 3.08; σ = 0.702). However, it is also important to note students scored the third highest for the significance standard of personal growth (μ = 3.08; σ = 0.572). The significance standard of critical thinking indicates whether students' goals or conclusions represent the major issues raised by their reflection on the experience. The results from this study suggest it is easier for students to establish goals as a result of their learning in the category of personal growth.

Another standard of critical thinking worth discussing is the writing standard. Students' writing standard scores were highest in the learning categories of civic learning (μ = 3.56; σ = 0.507) and personal development (μ = 3.44; σ = 0.583). In the category of academic enhancement, the writing standard was the second highest score (μ = 3.64; σ = 0.638). The DEAL model depth of learning and critical thinking rubric, used to measure writing for this study, considers the writing standard to assess whether the writing is free of typographical, spelling and grammatical errors. Results of this study would suggest students' writing was somewhere between good and excellent when completing articulated learning statements in all learning categories of personal growth, academic enhancement and civic learning. The scores for the writing standard measure were fairly consistent throughout each learning category.

Because students' critical thinking abilities were not assessed prior to the experience, we cannot suggest critical thinking abilities were developed during this experience. However, critical thinking skills have been found to increase simply because students reflected on their experiences (Jones and Brown, 1993; Lizzio and Wilson, 2007; Sessa et al., 2009). This study documented students' critical thinking abilities through reflection.

It is important to note that pre- and post-test design would be ideal to assess whether students developed critical thinking skills through this course experience; however, the use of articulated learning statements does not allow for this type of evaluation. Other measures may be able to document this type of assessment, but the measure in this study is not effective for making this conclusion.

Further research should examine whether differences exist in critical thinking abilities of students who participate in high-impact experiences as compared to students who do not. Also, students scored lowest in the category of civic learning. Civic learning involves reflection about how groups including individuals, organizations and policies work together to accomplish mutual goals. Students examine roles and approaches to change and how this plays out in different situations in their reflections about civic learning. During this domestic experiential learning trip, students participated in several service learning experiences, including helping community members in the tornado devastated community of Joplin, MO and volunteering in the CDEs at National FFA Convention. However, specific instruction in civic learning was not provided to the students. It appears that students were better able to articulate their experience and growth in the learning categories of academic enhancement and personal growth than civic learning. Future research could explore whether instruction in civic learning leads to an increase in critical thinking skill outcomes in the area of civic learning.

Another area of future research is to examine whether critical thinking skills transfer to learning outside of one course. After this course experience, can students apply the DEAL model to other experiences? Because critical thinking skills are important for college students to develop to thrive in highly demanding contexts upon graduation, it would be desirable to investigate whether these skills transfer outside of one course experience. Further research could examine which high-impact experiences provide the highest impact for the development of critical thinking skills and whether students are able to think more critically as they participate in more courses that offer high-impact experiences.

This inquiry does have implications for practitioners. In this study, students were instructed in one class period about service learning and the DEAL model. The DEAL model includes three categories of learning for student reflection. This is an important part of the process in regard to what students are learning from their experiences. Because students were provided with limited instruction on these categories, this may have impacted their ability to reflect critically in all categories. Practitioners interested in developing critical thinking skills of college students through high-impact experiences should allow ample time to provide clear explanations of each of the three categories of learning and their different criteria. Practitioners should also encourage students to actively engage in all steps of the DEAL model and document the outcomes at each step of the DEAL model.

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Fostering the Next Generation of Agri-food Entrepreneurs in Vermont: Implications for University-based Education[1]

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Abstract

This article details efforts to develop agri-food entrepreneurship education in a university setting. We propose a conceptual model of explicit, tacit and co-created knowledge delivered within a service-learning format. Interviews with university alumni revealed a need for more explicit knowledge as foundational building blocks. Interviews with faculty revealed that they focus more on tacit knowledge and experiential education and less on explicit knowledge. Our recommendations include introducing more business content earlier and for non-entrepreneurship majors, greater coordination, fewer departmental barriers and a diversity of faculty to deliver a more well-rounded experience.

Introduction

Importance of Food Entrepreneurship

The contributions of entrepreneurs to community economic development are well-known (U.S. Bureau of Labor Statistics, 2013). For rural states, food and agriculture (agri-food) comprises an important part of the economy. Vermont is, by at least one estimate, the most rural state in the US (Bishop, 2012) and not surprisingly, agri-food plays a central role in the state's economy. A recent study estimates that it provides 57,089 jobs (16% of all private-sector jobs), including 6,984 farms and 4,104 other food-related businesses (13% of all private-sector establishments) (Vermont Sustainable Jobs Fund, 2012). The total contribution of agri-food to the state's economy is estimated at US$2.7 billion (Vermont Sustainable Jobs Fund, 2011), about 12% of state GDP (U.S. Department of Commerce, 2012).

In addition to contributions to jobs and income, the agri-food sector has influenced the socio-economic wellbeing of rural communities. The devastating effects of farm consolidation and concomitant decline in farm numbers are well-documented (Ginder et al., 1985, Heffernan and Heffernan, 1986). Numerous studies have shown the positive socio-economic effects associated with a strong cohort of small and medium sized owner operated farms and businesses (Goldschmidt, 1947, Lobao and Stofferahn, 2008, Lobao and Meyer, 2001, Lyson et al., 2001).

Vermont has made agri-food based community and economic development a priority. Two of the institutions that are leading these efforts are the Vermont Farm to Plate Initiative (FTP) and The University of Vermont (UVM). In 2011 FTP released a strategic plan to place the agri-food system at the forefront of state economic development and sustainable job creation. The FTP initiative was created by a partnership between state government, non-profit and for-profit organizations; more than 1,200 Vermont residents provided input into the strategic plan.

Since 2010, Food Systems has been one of UVM's transdisciplinary strategic initiatives (Kolodinsky et al., 2012) and principles of sustainability are central to these efforts. In particular, the triple bottom line or three-legged stool (social, economic and environmental) model has been embedded in teaching, research and outreach efforts (Grubinger et al., 2010). A sustainable agri-food enterprise is one that operates in ways which minimize (internalize) external costs and maximize external benefits (Conner, 2004).

Community Entrepreneurship at UVM

The Community Entrepreneurship (CENT) major is housed in the Department of Community Development and Applied Economics (CDAE) at UVM. CENT is distinct

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from traditional business curricula in its location in the College of Agriculture and Life Sciences and thus is well suited to developing agri-food businesses. It is distinct from social entrepreneurship curricula in its emphasis on entrepreneurship as a sustainable community development tool and its integration in a departmental curriculum in which community development is the primary goal (Wang et al., 2010). The CDAE Department has a strong focus on experiential education, transdisciplinarity and stakeholder engagement as a means of meeting its community development mission (Baker et al., 2009)

Service Learning

UVM places strong emphasis on experiential education, particularly in the form of service-learning (S-L). S-L is "*experiential education in which students engage in activities that address human and community needs together with structured opportunities intentionally designed to promote student learning and development,*" (Jacoby, 1996). S-L increases both student retention of learning and student civic engagement and helps students to develop professional skills and goals (Eyler et al., 2001, Eyler and Giles Jr, 1999). Community partners in S-L courses benefit from useful projects, enhanced relationships with the University and links with other partnering organizations (Eyler et al., 2001).

UVM has developed a three phase model for S-L coursework (Williams Howe, 2010, Baker et al., 2009). Phase I, Skill Development, focuses on interpersonal communication: projects tend to be concrete, small scale, limited in scope and closely managed by faculty. In Phase II, Capacity Building, students apply Phase I skills, moving to higher levels of critical thinking through reflection. Faculty retain a strong management role but raise expectations of students in leading and meeting course goals. In Phase III, Empowerment, students collaborate with community partners to develop and meet project goals, including defining and understanding the issue at hand and developing the means to address it. Faculty work as mentors, empowering, suggesting and consulting rather than prescribing.

The following sections detail efforts to date to create an integrated S-L curriculum at UVM which fosters the next generation of sustainable agri-food entrepreneurs. We present entrepreneurship pedagogy and develop a conceptual model of the skills needed to be a sustainable agri-food entrepreneur. We then present methods and results of research conducted with UVM faculty and recent graduates to gauge how well key concepts and principles have been recently taught. Discussion focuses on implications for curriculum improvement.

Selected Literature: Key Elements of Sustainable Agri-Food Entrepreneurship Education

Why is entrepreneurship education needed? Gibb (2011) discusses the need for instilling an entrepreneurial mindset in students. This mindset is central to employability and to a wide range of personal and organizational contexts. Gibb (2011) emphasizes

students' ability to be creative and confident in their endeavors as underpinning the kind of flexible, adaptable workforce needed in today's economy. Yet Knudson et al. (2004) lament the lack of emphasis on entrepreneurship in agricultural economics and agri-business studies. Most established markets for agricultural products are commodity based. This system involves price-taking behavior: low cost, high volume sales which brings small per unit margins, requires little marketing effort from farmers and externalizes costs (Kirschenmann et al., 2008). Sustainable enterprise requires internalization of social and environmental costs. Agri-food entrepreneurs must find innovative and flexible ways to produce and market differentiated products (Conner, 2004).

What should be taught? A useful framework for what to teach is the distinction of explicit and tacit knowledge and its extension to include co-created new knowledge (Peterson, 2009). Explicit knowledge can be codified; it is separable from context and easily shared among people using manuals, instructions, etc. Tacit knowledge is gained by experience or practice; it is context specific and not easily shared. New knowledge is co-created by combining and sharing novel combinations of explicit and tacit knowledge among stakeholders (e.g., strategic supply chain partners) using experimentation and iteration. Peterson (2009) highlights how explicit knowledge is the least risky and most certain, yet has the lowest potential for innovation and strategic value. New knowledge is the least certain, most dynamic and unpredictable, yet has the highest potential for true innovation and highest strategic value.

Entrepreneurs need a certain degree of readily accessible explicit knowledge and most business curricula teach it in courses like accounting, corporate strategy, finance, law, marketing, law and organizational behavior (Hindle, 2007). One critique of typical business administration curricula is that they prepare students to work for others rather than for other own businesses (Hindle, 2007, Aronsson, 2004).

Tacit knowledge is needed to find and act on opportunity. One seminal theory posits the process of discovery, evaluation and exploitation of opportunity as the unique role of the entrepreneur (Shane and Venkataraman, 2000). Successfully navigating these tasks requires a set of heuristics to deal with the high degree of ambiguity and uncertainty inherent in the entrepreneurial process. Reliance on rational calculations and fact-based logic does not allow for the rapid decisions needed in the face of the brief windows of entrepreneurial opportunity (Alvarez and Busenitz, 2001). A critique of current entrepreneurial education is the lack of opportunity to gain tacit entrepreneurial knowledge – what it feels like to take action: discover, evaluate and exploit opportunities (Gibb, 2011). Peterson (2011) asserts there is an over-reliance of explicit knowledge among academic researchers (particularly applied economists) due to the lack of generalizability of tacit knowledge. Entrepreneurs need to create as well as absorb and experience knowledge. A key element

is the ability to engage in reflexive learning in which actors monitor their activities and have a theoretical understanding of themselves and others (Sarason et al., 2006).

Explicit and tacit knowledge may suffice for traditional enterprises but may be inadequate to foster sustainable enterprises. Peterson (2009) argues that transformational supply chain governance based on collaboration and co-creation of new knowledge is needed to address the "wicked" problem of sustainability. A recent study suggests that co-learning and collaboration across supply chains partners is needed to address the complexity of transactions within farm-to-institution programs, which have been called the vanguard of the alternative, sustainable agri-food systems (Buckley et al., 2013, Izumi et al., 2010). These transactions require innovations beyond conventional supply chain norms. Mechanisms cannot be simply explained (explicit knowledge) or figured out by individual actors (tacit knowledge) but need to be co-created by experiential negotiation, experimentation and adaptation within specific contexts (new knowledge) (Buckley et al., 2013).

Both Hindle (2007) and Gibb (2011) emphasize that entrepreneurship should not be taught solely in business schools. We need an approach that emphasizes experiential education, a mix of practitioners and academics, emphasizing creativity and action over canonical content Transdisciplinarity and experiential learning, particularly S-L, seem well-suited.

Conceptual Model

Our conceptual model posits that to best prepare students for a successful career in sustainable agri-business, an integration of both knowledge and skills education earned through service-learning and community engagement is essential. Principles of sustainability and the triple bottom line are not just theoretical models of agri-business, but opportunities to engage and embed students in enterprise (Figure 1). Education efforts should position students to gain all three types of knowledge: sequences of S-L classes can impart all three types in reflexive, self-reinforcing and additive ways. Phase I S-L imparts explicit knowledge (basic concepts) that prepares students for greater engagement in the entrepreneurial process. Phase II S-L provides students with tacit knowledge. Phase III S-L prepared students to generate new knowledge by engaging and problem-solving with stakeholders.

Process

Sustainable entrepreneurship education will be most effective when built on a foundation of explicit knowledge, offered during the early undergraduate years (Baker et al., 2009). Agri-food business leaders must have explicit knowledge of business plan development, financial management, marketing, distribution, food production regulations, labeling requirements, etc. Community engagement and contribution in Phase I S-L may include guest speakers and lectures in a classroom setting (Williams Howe, 2010). Information is presented

Figure 1. Pre and Post Exercise Quiz Questions
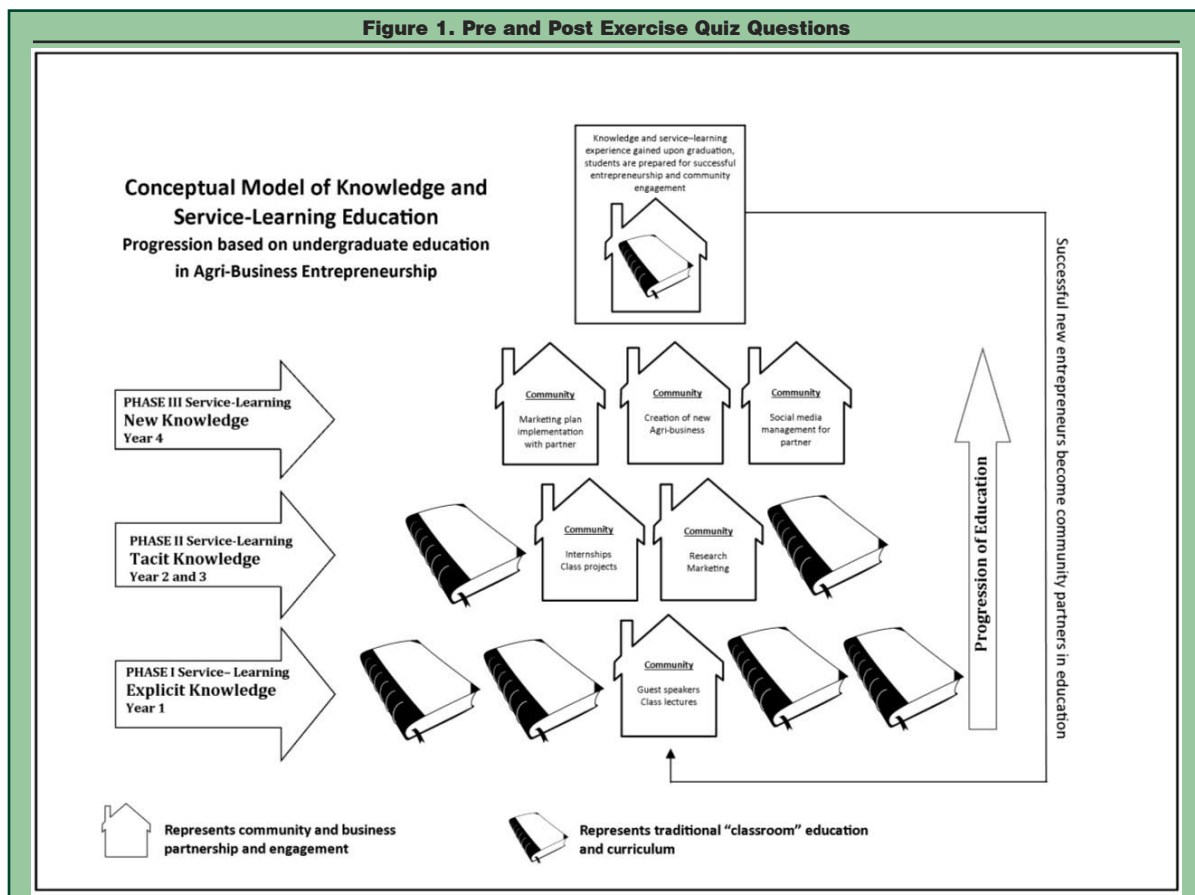
in a "how-to" dialogue, inviting students to begin the process of framing issues by connecting theory to practice. Gaining tacit knowledge is key in phase II of S-L delivery as it advances educational opportunities through collaboration and partnerships with community organizations (Williams Howe, 2010). Built on a solid foundation of explicit information, students are challenged to apply knowledge through critical and strategic thinking to meet goals with the community partner. Under close supervision, students work with community partners to conduct research, develop marketing plans, complete internships, or aid in writing public policy. Co-creation of knowledge takes place during phase III S-L education through community engagement. Students are prepared to independently apply acquired knowledge and skills. Community partners serve as mentors for students developing their own agri-business plans and provide opportunities for students to manage social media marketing, or the implementation of a marketing campaign.

Agri-food entrepreneurship education enhanced by a progressive service-learning curriculum provides several potential benefits for both the student and the community. The progression of S-L education results in a strong foundation of the three types of knowledge. The knowledge gained through service-learning demonstrates the student's ability to work as team member and independently in real-world, real-time situations. By building an education that encompasses and engages community, students understand and value social responsibility and sustainability in both theory and practice. The students will in the future have the opportunity to share their experiences and knowledge when they become community partners with future students in agri-food entrepreneurship. Businesses acting as community partners in educating students to be problems solvers and creative thinkers ensure that the skills needed for successful entrepreneurship are incorporated in education. This is a true "win-win-win" situation: businesses have a stronger employment pool, students have a unique educational experience and the university is providing a high-quality, marketable education.

Methods

We used a qualitative approach to explore the degree to which the conceptual model (Fig.1) is in tune with the curriculum at UVM, the Land Grant University of the state. The study was comprised of two sets of semi-structured interviews conducted simultaneously in the spring of 2013. We interviewed university faculty to better understand the way entrepreneurship and professional skills are taught at UVM. We interviewed recent UVM graduates to obtain their perspective on how their education prepared them for their professional careers. The study was deemed exempt by the UVM's Institutional Review Board.

Data Collection

A total of 15 face-to-face semi-structured interviews with faculty and a mix of 8 phone and face-to-face semi-structured interviews with former students were conducted. We used snowball sampling to select our sample which allows for the identification of information-rich key informants from well-situated people (Patton, 2002). We contacted faculty known to be involved in entrepreneurship education at UVM. After interviews, we asked for names of colleagues across the university we should talk to and for names of former students whom they knew had started a business, or were known to have an interest in starting one. The process was repeated until no new names emerged. Faculty members representing a wide variety of disciplines were interviewed: anthropology, business, community development and applied economics, engineering, geography, sociology and plant and soil science. The former students interviewed also represented several disciplines. The interviews were conducted by two researchers between February and May 2013 and lasted on average 45 minutes. We used two interview guides tailored to faculty and alumni in order to provide structure to the inquiry while allowing flexibility for follow-up questions and explanations (Herndl et al., 2011, Patton, 2002). Interviews were audio-recorded and transcribed.

Interview Analysis

Deductive Content Analysis (DCA) was used to analyze the interview transcripts. DCA is a systematic and objective means of describing and quantifying phenomenon that allows the researcher to test theory and conceptual models (Elo and Kyngäs, 2008; Burns and Grove, 2005; Kyngäs and Vanhanen, 1999; Patton, 2002). The team of researchers discussed and agreed on the codebook based on the conceptual model components (Graneheim and Lundman, 2004). It included the following codes:

- co-created knowledge,
- experiential education,
- learning/teaching about entrepreneurship,
- learning/teaching to become an entrepreneur,
- networking skills,
- passion and values,
- tacit knowledge,
- use of guest speakers.

Researchers conducted multiple readings of the transcripts and extant literature to develop an understanding of how faculty prepare students for their professional lives and to ascertain what former students learned, skills they wish they had learned and how they use these skills in their careers (Burnard, 1991, Charmaz and Mitchell, 2001). The interviews were coded with HyperRESEARCH 3.5.2. This qualitative analysis software allows for an efficient and manageable analysis of data while offering tools to compare codes and acceptance between researchers as well as reporting capabilities (Gerbic and Stacey, 2005, Staller, 2002).

Results and Discussion

Results are organized in two main themes in order to test the data against the conceptual framework: important knowledge and type of knowledge.

Important Skills
Faculty

Faculty named a broad array of skills needed by students (Table 1). Specific skills include spreadsheets, GIS, business, finance and research methods. Broader skills included communication and teamwork. The most often cited skills were teamwork, communication, knowing yourself/exploration and business/finance (Table 1). PhD trained faculty focused on broad skills whereas master level faculty focused on practical skills. For example, a former business owner with a master's degree said:

"*When they leave UVM, I would like to think that they understand the general laws of business and the general management of money plus being able to express themselves well in writing and to express themselves well in speaking.*" Faculty 13.

A PhD level faculty with no business background stated: "*Understanding is more important to me than the students understanding how to do.*"

Table 1. Knowledge considered important by faculty organized by specific to broad (n = 15)		
Knowledge	Frequency in %^{z}	Type of knowledge
Theory associated to discipline	13	Explicit
Business/Finance	27	Explicit
Computer literacy	7	Explicit
Research methods	7	Explicit
Practical skills	13	Explicit
Communication	33	Tacit
Time management	13	Tacit
Team work	33	Tacit
Networking	7	Tacit
Observation	7	Tacit
Apply theories and concepts to real world	13	Tacit
Knowing yourself/exploration	27	Tacit/co-created
Analysis	13	Tacit
Problem solving	13	Tacit/co-created
Critical thinking	27	Tacit
Note. ^{z}number of interviewees who reported this being important knowledge		

Table 2. Skills and knowledge considered important by alumni organized by specific to broad (n = 8)		
Knowledge	Frequency in %^{y}	Type of knowledge
Theory associated to discipline	37	Explicit
Finance	100	Explicit
Computer literacy	62	Explicit
Marketing	75	Tacit / Explicit
Risk management	50	Tacit
Networking	87	Tacit
Passion/values	75	Tacit/co-created
Problem solving	37	Tacit/co-created
Critical Thinking	37	Tacit/co-created
Note. ^{z}number of interviewees who reported this being important knowledge		

Alumni

Much like the faculty, alumni emphasized important skills ranging from specific to broad (Table 2). Specific skills include spreadsheets for financing or social media for marketing. Broad skills include networking or passion and values. However, the quality and degree of education varied by major and department – especially with regard to entrepreneurship.

"*I really wish I had learned risk management tools for farming. It's really tough to decide not only certain decisions, like the impact of using pesticides, but the factors to consider: customer demand, higher yield, more profit but higher costs, my own morals… there's' just so many factors.*" Alumnus 7.

Many alumni recognized the importance of business fundamentals, but they often did not extend beyond their department to take courses in them because they were not required and the courses sometimes appeared unapproachable. One sustainable agriculture major said:

"*They [finance courses] weren't required so I didn't even consider taking them. I mean it's kind of a daunting subject for someone outside of the business school, but basic book keeping is certainly integral in order to run your own business well.*" Alumnus 2.

Though most students had little education in business fundamentals, nearly all of the students had exposure to broader concepts including critical thinking, problem solving and networking. Students in specific majors (such as sustainable agriculture) did not receive business education: their curriculum focused on specialization (such as farming practices) and students did not choose courses outside their major. The emphasis on broader concepts equips students for a wide range of careers, but may neglect the building blocks of business skills.

Types of Skills

We classified skills alumni and faculty identified important as explicit, tacit or co-created. Tables 1 and 2, show that specific skills such as the theory associated with a discipline or computer literacy fall under the category of explicit, while broader skills such as analysis and critical thinking were categorized as tacit.

Explicit Skills
Faculty

Explicit skills tend to be taught early on in the curriculum using a more traditional teaching approach such as lectures and textbook learning. The interaction with the community for explicit skills was limited and used as an initiation for future interactions with community partners:

"*This semester we served a non-profit organization so it was pure service which is the lowest level of service learning. At their conference we just served in whatever capacity they needed. Some people poured coffee, some people helped set up tables and some people gave directions.*" Faculty 1.

Additionally, some faculty members pointed out that the students must be able to apply the theory that they have learned in class to the real world.

Alumni

Many alumni reflected on their careers after graduation to show the importance of the sometimes

dry, but important, explicit skills. Consistently, alumni recognized how the context of acquiring skills impacted how effectively they retained – or did not retain – the information.

"*It [core information technology class] taught us 'the ins and outs of Microsoft Office' and it was a serious bummer when I realized I had to learn it again because, unfortunately, I remembered none of it.*" Alumnus 7.

Participants often pointed out their ability to fully comprehend explicit skills once they were able to apply it. Separate from the method and point in curriculum where explicit skills were taught, alumni in specialized majors emphasized the lack of focus on fundamental business skills, such as credit or tax information. Repeatedly, participants would emphasize their lack of exposure or little interest in learning explicit skills that they recognized as important. This was particularly evident in students from scientific majors. The interviews suggest that explicit skills reinforced or taught in tandem with experiential education can both spark interest and enable students to retain the information beyond the classroom.

Tacit Knowledge
Faculty

Most of the important knowledge was categorized as tacit including communication, time management and team work. It represented putting theory and skills from the classroom to use. Tacit knowledge is taught through a mix of theory, examples, guest speakers, internships and S-L.

"*You can go to conferences, talk to people, work on projects, internships and it becomes this very rich and dense product you can draw from and I think that I often comment that it's up to you and it has to be an ongoing process so that every job is a tool you can put in your tool box.*" Faculty 8.

Faculty emphasized the need for students to be exposed to the outside world and able to put in action what they learned in class. Faculty use reflection to allow the students to connect the theory with their experiences and their learning. It can be a daunting exercise for students, but it is seen by the faculty as a useful method to reinforce their teaching and encourage reflexive learning.

Alumni

Once explicit skills are taught, students have the opportunity to test out theories, express creativity and learn lessons hands-on. Many alumni reflected on tacit knowledge as some of their defining moments in their undergraduate careers. They also emphasized the importance of experiential learning, including networking, guest speakers or attending conferences.

"*It [service learning course] allowed me to connect on a deeper level with fellow students and with the greater community... It actually introduced me to some people who I've since worked for after graduating.*" Alumnus 8.

It was clear that the courses and experiences that involved tacit knowledge were among the most memorable. Alumni shared stories that marked pivotal points as undergraduates, where in some cases, passions were recognized as careers.

Co-created Knowledge
Faculty

Co-created knowledge was not as often identified specifically. Co-created knowledge comes from innovation, collaboration and adaptation; accordingly, the highly complex characteristics of co-created or new knowledge make it a more rare form of education. We found two examples of co-creation of knowledge. First, it could take place in the classroom when faculty encourage their students to interact with other students as colleague.

"*We are also using knowledge networking in the class. I am teaching them to consider the rest of their peers in the classroom not as students but as others consultants, and, if another consultant appears to have another connection in the outside world or a skill set you should draw on that other connection in the class even if they are outside your group.*" Faculty 1.

In this situation, the faculty simulates the workplace environment to encourage students to work with another and solve problems.

In the second scenario, co-creation of knowledge occurred when students partnered with a community partner with a mission of accomplishing a common goal.

"*I paired the students with a particular issue or topic so one was transportation to the workplace, one was transportation to health care. The groups were to work with the refugee communities and more specifically with service providers. And to the service provider I said here are these highly qualified groups of students if you are interested in working with them. So I left it up to them, and the groups went and prepared something that was very concrete.*" Faculty 4.

Other faculty had students develop marketing plans for businesses, develop prototypes or organize events for community partners. A strong emphasis on community and awareness of peers as collaborators reinforced the concept of co-creation of knowledge.

Alumni

One notable instance of co-created new knowledge was in an entrepreneurship course where students had to conceptualize, produce, market and sell their own product.

"*At first, our merchandise sold itself… but then we realized our sales were lagging and so we sat down and got creative…. I think my group did well because we adapted and didn't accept defeat. We reevaluated what we had and asked, 'How can we get more people to stop at our table?' …We completely changed our approach and made the emphasis on the customers: interacting with them, setting up activities around the booth… We knew our product was great; we just had to get them*

there. And we did. We got the new customers, people weren't drawn in by what we sold, but by how we sold it." Alumnus 8.

Consistent Themes Enabling New Knowledge: Critical Thinking, Problem-Solving and Work Ethic

"*My advice for people who have an idea of what they want to do, 'Talk to as many people as you can. Learn from them. Run ideas by them. Get feedback. Get inspired. Collaborate. Adapt and then evolve.' At times, you really won't want to get up, but you gotta persevere… Being your own boss isn't easy: there's no salary, no one telling you to wake up in the morning. It's even worse when you're losing money. But if you really love it, you'll make it work.*" Alumnus 4.

Co-created or new knowledge occurs outside of the ordinary classroom setting. The results can be very beneficial but the process might be difficult to implement in a traditional university campus. In the above example with an nontraditional entrepreneurship course, it seems that the retention of co-created knowledge must also be attributed to the students, whose personal commitment transformed an assignment into an opportunity for growth.

Comparison to Conceptual Model

UVM Faculty, particularly those with doctoral (e.g., PhD) degrees, placed greater emphasis on tacit and co-created knowledge, which potentially equips entrepreneurs with the ability to create opportunity (Alvarez and Busenitz, 2001). However, there is a gap in the teaching of explicit knowledge; some faculty expect that students learn explicit knowledge on their own. Doctoral level faculty tended to encourage higher thinking and the connection of various types of knowledge, rather than delivering it in classroom formats. In contrast, master's level faculty emphasize practical skills and explicit knowledge. There are two possible explanations for the difference. First, faculty with business experience and faculty with experience outside academia know first-hand the types of skills an entrepreneur needs. Second, the university has traditionally been a place of higher knowledge and thinking and PhD level faculty might be more inclined to favor these types of skills as they have been immersed and trained in these. S-L classes provide opportunities for gaining tacit and co-creating knowledge by bringing in community partners with a different set of skills and tangible projects to work on.

UVM alumni, especially those in non-business or economics majors, discussed a need for greater emphasis on explicit knowledge, particularly basic business skills and knowledge like marketing, accounting and finance. Nearly all alumni had robust exposure to broader, conceptual skills (networking, problem solving, passion/values) often outside the classroom (S-L, conferences). Conceptual and experiential education play vital roles in preparing all students to be enterprising and therefore more broadly employable in the current

and future settings (Gibb, 2011), as long as a proper explicit knowledge foundation is in place.

Implications

Implications based on the study findings include:
- Students would benefit from classes early in the curriculum with heavy emphasis on explicit, business-related content, connected to real-world applications. In more advanced curriculum, these explicit skills would be revisited, augmented and applied further in real life. A mix of faculty with various educational and professional backgrounds will ensure that students experience a well-rounded education. There is a need for availability of business curriculum to non-business/economic majors. This could be achieved using more cross-listed classes and looser departmental barriers.
- Faculty advisors need a better understanding of course offerings outside their departments to help students develop long term learning goals based on student passion and interest in the first and second year of a four year degree.

Summary

Training the next generation of agri-food entrepreneurs in a university setting requires a wide range of skills. This paper details efforts to create an integrated S-L curriculum at UVM to foster the next generation of sustainable agri-food entrepreneurs. Our conceptual framework, based on theories of explicit, tacit and co-created knowledge, utilizes a service-learning format to deliver each information type in a sequential, reinforcing manner. We recommend the use of a three phase service-learning format, featuring a greater emphasis on business content earlier in curriculum and greater access for non-business majors. This approach may require greater coordination and fewer departmental barriers, as well as a diversity of faculty to deliver a more well-rounded experience.

The main strength of this paper it its application of well-known models to food entrepreneurship in a university and state which place high priority on food systems. The weakness is a small, non-representative sample of respondents. Future directions of research include replication at other locations and longitudinal studies of graduates of the curriculum.

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Structuring a Distance Education Program to Attain Student Engagement

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Abstract

Institutions of higher learning are adopting distance education courses to make it easier for students to obtain certificates, minors and degrees. A key aspect in the success of distance education programs revolves around how well the programs engage students during their learning. Developing an online program presents choices in determining appropriate learning strategies in course delivery and student engagement. This reflection discusses organizing a multi-institution distance education certificate program and choices for incorporating student engagement into the courses of an online agricultural and environmental law certificate program. Institutions and instructors may need to expend greater efforts to engage students in activities that will enhance their distance learning courses.

Keywords: communal activities; learning experiences; oversight; student engagement; social presence

Introduction

Students and universities have become receptive to course work being conducted online (Fahy and Steel, 2008). In some cases, students cannot be on campus at the times course offerings are available due to jobs or lack of proximity to a campus (Mayadas et al., 2009). In other cases, online courses can provide instruction in topics for which no on-campus course is available. Budgetary pressures are also leading to more online courses (Murray et al., 2012). Collaborative efforts among institutions have emerged as a way to provide educational opportunities and programs that otherwise would not be possible (Great Plains IDEA, 2003).

Some of today's students expect to be able to engage in online course work (Michael, 2012). Online courses provide better access, convenience and flexibility to learn materials and gather credentials for employment (Conceiçâo, 2006). Furthermore, business firms may lean on distance education as a means for helping employees receive additional training (Fahy and Steel, 2008). Distance education involves different roles for instructors and students than in face-to-face courses

(Berge, 2008; Conceiçâo, 2006). Distance education often involves a partnership of teaching and learning that requires instructors to engage in new kinds of activities (Conceiçâo, 2006).

Institutions offering distance education courses have an obligation to provide meaningful learning experiences to students. Online instruction is more time-intensive than classroom teaching (Mayadas et al., 2009) and distance courses may require extra effort to incorporate student engagement activities. Online instructors are challenged in structuring their courses to provide students valuable educational experiences and training and institutions and faculty need to contemplate how they can create a positive learning environment to encourage students to complete course and degree objectives. Choices accompanying the organization and implementation of distance education courses are important in meeting obligations to students who cannot be on campus.

Distance Learning for Agricultural and Environmental Law

Ten founding universities formalized the Great Plains Interactive Distance Education Alliance, known as "Great Plains IDEA," in 2002 to offer distance education courses to students at member universities spread over vast distances in sparsely-populated areas of the American Midwest (Great Plains IDEA, 2003). By using faculty resources from member universities, students were able to take courses and earn degrees that were not available at their own institutions (Carnevale, 2001). Subsequently, several deans at colleges of agriculture led the development of an alliance of agricultural colleges that culminated in the formation of "AG*IDEA," a consortium of universities desiring to employ distance education courses in agricultural and related sciences. In 2007, AG*IDEA joined Great Plains IDEA as an affiliate (AG*IDEA Bylaws, 2008).

Nineteen universities are AG*IDEA member institutions (AG*IDEA Member Universities, 2012) and nine programs have been established (AG*IDEA Programs, 2012). Students register for AG*IDEA courses

at their home institution and pay a common tuition fee per semester-credit hour. This fee may be higher than the fees for regular campus courses in order to pay for the infrastructure and expenses connected to distance education courses. The fees are divided per agreement among the course's teaching institution, the student's institution, and the AG*IDEA national office. Class size is limited: these are not massive open online courses that have recently garnered considerable attention. This means the courses can be structured to involve student engagement.

A Work Group in Law

Acknowledging that their institutions lack the resources to offer desired training in undergraduate legal materials, several agricultural lawyers from land-grant universities organized a work group in 2009 to develop a distance education program offering a certificate in agricultural and environmental law under AG*IDEA. The efforts of the work group were to make law courses available for students in numerous agricultural and environmental disciplines across several states to better prepare students for employment. The work group consisted of lawyers affiliated with undergraduate legal education rather than law schools. Through gatherings at national conferences, monthly teleconference meetings and two workshops, the work group came to a consensus on the business plan. The AG*IDEA certificate program in Agricultural and Environmental Law was approved in November 2011 (AG*IDEA Business Plan, 2011).

The law work group faced the problem of developing a program that provides a service to various degree programs without credentialing for a degree or employment situation. An initial major decision involved whether all students should take a basic law course that would serve as a prerequisite for additional specialized law courses. Conceptually, a mandatory prerequisite made sense: students could learn the basics in one course and proceed with more specialized topics in subsequent courses. Logistically, a prerequisite would require major adjustments in existing courses being taught and in scheduling courses. All of the existing law courses, including some that were already being taught as distance education courses, were stand-alone courses without a prerequisite. The work group decided that if faculty could not convert their existing courses to distance education courses, they would not teach in the program. Thus, it was decided not to adopt a prerequisite law course.

A second issue was whether the certificate should include two-hour courses or only three-hour courses. Two-hour courses were appealing for several specialized legal topics dealing with agriculture and the environment. However, incorporating two-hour courses into the program would require more courses to be taught to meet the 15-hours of the certificate program. The work group decided that all course work should involve three-hour courses. Courses include Agricultural Law, Environmental Law, Food Law, Ethics in Ag Business, Public Health Law, Agricultural Policy and Resource and Environmental Economics.

Implementation Issues

With the adoption of the certificate program, five institutions commenced offering AG*IDEA courses in 2012. However, issues surfaced about instructor credentialing, listing of courses, course content and program assessment. Significant challenges needed to be addressed by the work group to achieve a successful program. An initial hurdle was the credentialing of faculty from other institutions prior to offering AG*IDEA courses. At least one university had a policy under which every distance education course must be taught by a faculty who has been accepted as an adjunct faculty. This required faculty to apply for adjunct status and be accepted by the faculty of a department before their AG*IDEA courses could be offered at the credentialing university.

Some institutions had difficulties listing AG*IDEA courses due to the need to develop new courses. In many cases, the development and adoption of new courses required two semesters. Due to time lags in getting AG*IDEA courses listed at each participating institution, not enough students enrolled in some scheduled courses so the courses were not taught. The program is dependent on the voluntary efforts of individuals at participating institutions in getting courses adopted.

Enrollment in scheduled distance courses has also been low due to the decision by an institution to forgo offering a course that does not meet the needs of its students. Adoption of AG*IDEA courses is voluntary. A related problem is getting information on scheduled courses to students to enable them to register. At least one institution has experienced difficulties in communicating information to students that has severely limited enrollment in AG*IDEA courses.

While the AG*IDEA concept involves accepting any course offered by a member institution, concerns exist about course content. Given the potential discord that could accompany a discussion about course content, the AG*IDEA work group has not addressed the issue. This raises the possibility that a particular AG*IDEA course may not be comparable to the same face-to-face course of an institution and may not cover materials desired for students. While this may be a problem, it is no different from a face-to-face university course in which multiple instructors use different texts and different materials are taught. For AG*IDEA courses, if a problem with course content is observed, an institution can decline to offer the deficient course thereby resolving the issue.

Student Engagement

The development and implementation of a distance education certificate by a work group in agricultural and environmental law raise concerns about adequate oversight to ensure that students are sufficiently engaged in a positive social environment. In the development and delivery of distance education courses, the work group

made choices that impact the scope of materials and delivery mechanisms. In some cases, these choices were made without full consideration of how the decisions would affect students' social presence and engagement in learning experiences. By examining the efforts of the work group, ideas may be identified to foster a social presence that encourages learners' efforts and maintains a hospitable atmosphere for opinion and feedback (Sung and Mayer, 2011).

Law involves the consideration of tradeoffs, compromises and the imposition of beliefs by legislative bodies, regulators and courts. Teaching law needs to capture the principles and beliefs that contribute to legal proscriptions. A dialogue among students is important in raising principles and beliefs, displaying divergences of opinions (Chen et al., 2010) and recognizing the difficulties of prescribing norms for business and social issues. Thus, for the AG*IDEA agricultural and environmental law program, it is important that students be able to engage in a discourse of contemporary controversial issues rather than simply reading established written laws. Students need to become engaged with their instructor and each other and have opportunities to express themselves (Steinman, 2007). This may not occur in an online course if opportunities for engagement are not purposefully incorporated into the course's requirements (Hege, 2010).

Social Environment and Retention

The importance of learning within a social environment has been recognized by educational theorists (Pate et al., 2009). Students benefit from hands-on participation in practicing and gaining skills (Gordon and Edwards, 2012), and peer learning can be an important component of course work (Schonfeld, 2005). Instructors may be challenged in developing an online course that integrates aspects of community learning and provides meaningful skills (Cameron et al., 2009). Online courses may not provide these experiences due to the absence of nonverbal signals (Gordon and Edwards, 2012) and insufficient collaborative strategies in projects and problem-solving components (Williams et al., 2011). Yet online courses can be structured to incorporate group-based tasks with student collaboration that can foster engagement and augment learning skills (Ituma, 2011). Transactional distances can be reduced to engage students in an interactive learning environment (Steinman, 2007). This involves activities that require students to share their personal opinions, values and beliefs with others (Black, 2005).

Student engagement is also important for retention of students in courses. Some evidence suggests that distance education programs experience difficulties in retaining students as documented by higher dropout rates (Park and Choi, 2009; Steinman, 2007; Willging and Johnson, 2004). Although it may be unfair to compare these dropout rates, the problem should not be ignored. Faculty teaching distance education courses need to exert efforts to enhance student satisfaction with their courses.

The external factors that contribute to students dropping out of courses are difficult to control. Working students often experience difficulties juggling their dual loads (Willging and Johnson, 2004). The absence of support from family (Park and Choi, 2009) or the lack of a definitive career motive (Willging and Johnson, 2004) may lead some students to discontinue distance courses. However, institutions do have some role to play in making sure that distance course work is enticing (Willging and Johnson, 2004). Research suggests that students are less likely to drop out if they are satisfied with their courses and the courses are relevant to their lives (Park and Choi, 2009). While satisfaction and relevance may come from many sources, a positive social presence can contribute to student decisions to complete courses (Borup et al., 2012; Willging and Johnson, 2004). This suggests that greater student engagement should be encouraged so that greater numbers of students complete distance courses.

Promoting Student Engagement in Distance Courses

The quality of student interaction contributes to the success of learning and teaching online (Mayadas et al., 2009; Nandi et al., 2012). When students interact with each other, they can bring their opinions, values and beliefs to the conversation (Steinman, 2007). Academic engagement by students affects their perceptions of academic quality (Richardson et al., 2003). Various asynchronous and synchronous technologies exist to augment student interactions (Nandi et al., 2012). These technologies play a role in student engagement and assist instructors in supporting academic engagement.

One idea for early student engagement is to create an online space for students to introduce themselves (Hege, 2010). Students can be requested to share something about themselves or why they are taking the course. Other students can see with whom they will be associating and contemplate commonalities. Adding pictures increases the sense of community.

The most common method for student interaction is to require regular postings on a community bulletin board or discussion forum so that others in the class can be connected to the materials being covered (Hege, 2010; Maushak and Ou, 2007; Philip and Nicholls, 2007). Student reflections and interpretations of course materials can force them to read the materials for greater insight. By having an allocated time frame for postings, students can be required to keep up-to-date with the course (Philip and Nicholls, 2007). This engagement also helps students support each other in their learning and quest for knowledge (Pate et al., 2009).

A third engagement activity involves the formation of groups to complete a project (Maushak and Ou, 2007). Groups can use various communication tools for sharing ideas, facilitating collaboration and discussing how to

complete the assignment. In this manner, each student develops skills in interacting and communicating with a few other individuals in collectively responding to an activity.

Video sessions by the instructor allow students to view their instructor and can send important messages to students (Borup et al., 2012; Hege, 2010). Students can visualize their instructor, detect a personality, view enthusiasm for the materials and better gauge the instructor's expectations (Borup et al., 2012). Students may also be required to post videos for a course, such as project reports.

Another idea is for an instructor to utilize a live chat program with individual students (Hege, 2010). Research has shown that the role of teachers in supporting academic engagement is important (Richardson et al., 2003). A personal connection between a teacher and each student enhances students' learning experiences and retention (Sitzman and Leners, 2006).

The AG*IDEA work group has not interjected itself into the interaction and engagement activities of instructors for individual courses. It is assumed that the instructor's institution is responsible for monitoring its courses and the success of its instruction programs. Yet, given the issue of retention in distance education programs, greater efforts might be expended by the work group in helping instructors design and deliver courses that are relevant to learners' needs (Park and Choi, 2009).

Options for Reaching Students

Many faculty and students assume that online courses should be asynchronous learning so that students have the flexibility of completing course work after hours and on weekends. However, two other options are available. First, a course can be delivered synchronously through video technology. Second, a blended course consisting of some synchronous sessions and mostly online work offers a compromise that may maximize student engagement.

Asynchronous Delivery

Asynchronous delivery may result in a low level of social presence that can negatively affect a course (Liu et al., 2007). Yet this method of delivery does not have to be static. Several opportunities exist to use technology so that students become engaged with other students. These include student collaboration, breakout groups, chat rooms and group projects (Oliveira et al., 2011). Asynchronous videos that are archived can also help students develop a connection to the instructor and provide opportunities for instructors to interject enthusiasm and encouragement (Borup et al., 2012). By employing Google Hangouts or other software, students may be able to engage in extemporaneous discussions that are important for group-interaction skills (Roseth et al., 2013).

Synchronous Delivery

An instructor may select synchronous learning where students participate in live presentations online at scheduled times. Synchronous learning environments have some major advantages including presence, time management and socialization (Haughey, 2007). For many undergraduate students (18-22 years of age), sessions involving a simultaneous video helps them develop an emotional connection to their instructor (Borup et al., 2012). Synchronous learning allows student participation during online sessions, which is enhanced if students are required to connect via video when they are speaking. With visual images of their classmates, there is a social presence that may include students' facial images that can emotionally connect them to the group.

Synchronous learning also helps students maintain a schedule that generally precludes them from waiting to cram materials into a few days or weekends (Schonfeld, 2005). With the adoption of live video sessions, synchronous learning involves communal activities that may be significant in engaging online students in meaningful learning experiences. Furthermore, synchronous learning can include archived lectures for students who occasionally have conflicting obligations or experience technology failures. These students can view the lecture and hear contrasting viewpoints at a later time, but this asynchronous delivery is accompanied by less engagement.

Blended Learning

In addition to asynchronous and synchronous presentation techniques, blended learning with face-to-face interactions and online experiences is a third possibility (Garrison and Kanuka, 2004; Garrison and Vaughan, 2013; Roseth et al., 2013; Vaughan, 2010; Vaughan and Garrison, 2005). Blended learning can create dynamic and vital communities of inquiry for students to be engaged with each other (Vaughan, 2010). By strengthening social, cognitive and teaching presence, a community of inquiry enhances learning (Akyol et al., 2011). Some feel that blended modes of distance education are able to maximize the best elements of online and face-to-face learning (Murray et al., 2013).

Blended courses can be effective in offering students meaningful preparation experiences and discussion possibilities (O'Brien et al., 2011) as well as meeting student expectations for a distance education course. The face-to-face time of a blended learning approach for interactive instructor-led problem-solving tutorials is highly valued by students (Edginton and Holbrook, 2010). Yet these courses also offer flexibility to students for fitting online materials into their schedules. A redesign of a synchronous class with fewer synchronous sessions and additional online course work can augment learning approaches to realize increased effectiveness, convenience and efficiency (Vaughan, 2010).

Given the minimal oversight of AG*IDEA courses being offered, concerns exist whether the learning

experiences incorporated in asynchronous courses are sufficient. The AG*IDEA work group needs to become involved in the quality of the learning activities in support of active learning and interactions (McNaught et al., 2012). Until the work group institutes a course assessment procedure, some courses may fail to incorporate student engagement mechanisms that support learning outcomes of knowledge and skills, mental models and higher-order thinking skills (McNaught et al., 2012). While the newness of the certificate program precludes any data on retention, it does not foreclose actions to address issues that have been found in other distance education programs such as encouraging greater engagement.

Concluding Thoughts

Experiences in an AG*IDEA work group that implemented a multi-university law certificate program highlight a need to do more with engaging students in distance education courses. Institutions that want to reach additional students through online courses need to recognize the commitments required to provide students a quality education. Online courses including massive open online courses that decline to require student engagement are simply specialized lessons away from campus. They are not imparting the engagement skills desirable for jobs and careers. Institutions need to provide support for the development and delivery of online course offerings so that students develop skills in interacting with others. Student engagement skills are needed to provide a quality education that is satisfying to students (Murray et al., 2012).

Instructors might resort to blended learning where students are occasionally present in a synchronous classroom so that visual interactions can take place. To develop a presence, students can be required to have video capabilities so others can see them when they contribute to a discussion. Students also can be required to form breakout groups and interact via distance communications. Through these techniques, students can experience being together and engaged with classmates.

Online courses can involve a meaningful community of inquiry that provides students a quality learning experience. Because of the physical separation of students and the instructor, conscious efforts are required to engage students. The experiences of the AG*IDEA work group implementing a distance certificate program disclosed that faculty need to remind their administrators of their institution's obligations to online students. The goal of distance education is not simply to offer off-campus courses but to reach additional students and impart skills for their employment and careers. Institutions, administrators and faculty who decline to be concerned about the learning experiences incorporated into online courses are failing their students.

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Getting it to Click: Students Self-Perceived Critical Thinking Style and Perceptions of Critical Thinking Instruction in Face-to-Face and Online Course Delivery

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Abstract

In higher education today there is a high demand for online education, but what is the price paid for making that transition? The purpose of this study was to examine the foundational differences between critical thinking instruction face-to-face and online. Students enrolled in a face-to-face course and students enrolled in an online course were asked to evaluate their self-perceived critical thinking style to compare changes in development between the two modes. Additionally, students were asked to evaluate the extent to which they perceived the instructor to emphasize critical thinking as part of the course instruction. The study, which took place from fall 2011 (face-to-face) to summer 2012 (online), showed that students in an online environment showed greater gains in "seeking" behaviors than their face-to-face peers. However, both groups showed that there was a high level of support for the course instruction emphasizing critical thinking.

Introduction

In today's higher education environment there is an increase in the demand for instructors to transition traditional face-to-face courses to online delivery (Astleitner, 2002). Ultimately, the challenge becomes maintaining the integrity and rigor of course instruction across different modalities. This can often be overwhelming, time consuming and a perceived barrier to faculty. With broad concepts like critical thinking the means by which a faculty builds student capacity can greatly differ between traditional face-to-face instruction and online delivery. However, faculty wants more than anything to maintain the consistent outcomes of instruction regardless of the delivery method.

"*It seems reasonable to suggest that critical thinking ability is one such enduring skill, that it is a central element in lifelong learning and that it is an appropriate skill for colleges and universities to develop among students*"

(Terenzini, et al., 1995, p. 24). Critical thinking has long been a crucial element in higher education curriculum. A National Institute of Education report in 1984 concluded, "*A college education should enable students to adapt to a changing world and that successful adaptation requires 'the ability to think critically, to synthesize large quantities of new information'*" (as cited in McMillan, 1987, p. 3).

University faculty are responsible for increasing content knowledge, in addition to increasing students' skill set. Though students may not retain most of the information digested during their college careers, the critical thinking component is one that will remain for the future. For this reason alone, great emphasis is, and must be, placed upon the initiation and/or development of a student's critical thinking style and capability.

Further, MacKnight (2000) reported that critical thinking goes well beyond just how an individual thinks and affects communication in various forms. This goes beyond course instruction and can be practiced daily. In many online environments this level of critical thinking development occurs in online discussions, including web-based chats, discussion boards and email (MacKnight, 2000).

"*While common sense and the experiences of hundreds of college professors suggest that attending college results in improved critical thinking of students, there is little research reported here to suggest how such improvement takes place*" (McMillan, 1987, p. 11). Vast research, including McMillan's (1987) comprehensive study review, has been conducted regarding the enhancement of college student's critical thinking abilities. One way to improve critical thinking is through classroom teaching. "*It has been assumed that if teachers use appropriate instructional methods and curriculum materials, students will improve their critical thinking skills*" (Young, 1980) (McMillian, 1987,

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p. 4). Furthermore, it is concluded that smaller classes with a student-centered, discussion emphasis are most effective (McMillan, 1987, p. 4).

Furthermore, Daly (1990, as cited in Shafersman, 1991) postulated that employers identify with the nature of critical thinking as a means for increasing the United States market in a global economy. This perception of employers is not just limited to global markets, however in the 2006 publication, Are they really ready to work? Nearly 92% of employers ranked critical thinking and problem solving as very important, yet only 26% ranked recent graduates' critical thinking and problem solving skills as excellent. This has created a concern that higher education is not producing graduates with the basic skills sets to be successful in the workplace.

More recently, the Association of Public and Land Grant Universities (APLU) in a partnership with the University Industry Consortium (UIC) completed a study, which provided insight into the perceptions of alumni, faculty and industry employers about the soft skills necessary for success. Crawford et al., (2011) showed that by majority, employers and students alike placed effects of decisions within their top three skills of the decision-making cluster. Additionally, the top two for all groups were: 1) Identify and analyze problems and 2) Take effective and appropriate actions.

Faculty are encouraged to develop critical thinking through the use of specific pedagogical tools including: asking the right questions, listening, sharing work, building on others' ideas and constructing understanding. While this list is not exhaustive, it does present a challenge of how these tools can and should be used.

In order to fully understand the implications of these perceptions a further examination of the literature related to critical thinking and online instruction is necessary.

Theoretical Framework and Literature Review

The theoretical framework driving this study is Beyer's (1987) model for how best to teach thinking. Beyer's framework includes six stages: 1. Introduction, 2. Guided practice, 3. Independent application, 4. Transfer and elaboration, 5. Guided practice and 6. Autonomous use. Beyer argues that any thinking skill can be learned with a high level of proficiency when that skill proceeds through all six stages. The following brief definitions outline each of the six stages:

- Introduction – the initial instruction related to a specific thinking skill, usually a single lesson.
- Guided practice – lessons in practical execution of the skill with instructive guidance.
- Independent application – repeated opportunities for students to practice the skill on their own.
- Transfer and elaboration – shows students how to apply previously learned skill to a new setting.
- Guided practice – repeated practical execution in the new setting.
- Autonomous use – students demonstrate ability to use thinking operation on one's own.

Beyer (1987) further elaborates that the teaching of thinking will be useless unless the appropriate teaching strategies are used. "Establishing and maintaining a structure that facilitates the teaching and learning of thinking is extremely important to improving student thinking" (Beyer, 1987, p. 83). For the purposes of this study the following framework guides the use of critical thinking as the specific thinking skill or strategy of interest.

Critical Thinking

For more than 20 years, researchers have been fascinated by the nature of critical thinking. This has been a developing concept in higher education since 1990 when Peter Facione challenged colleagues to define critical thinking through a Delphi study. The resulting work defined critical thinking as "*purposeful, self regulatory judgment which results in the interpretation, analysis, evaluation and inference as well as the explanation of the evidential, conceptual, methodological, criteriological, or contextual considerations upon which judgment is based*" (p. 2). Rudd et al., (2000) furthered this concept citing that critical thinking is a "*reasoned, purposive and introspective approach to solving problems or addressing questions with incomplete evidence and information for which an incontrovertible solution is unlikely*" (p. 5).

In higher education the emphasis has often been on the measureable outcomes associated with skill development. This has resulted in a narrow focus of critical thinking and contributed to a skewed view characterizing it as an assortment of skills rather than a complex and intentional process allowing for individuals to make reasoned and judicious decisions (Paul, 1990). Within Facione's (1990) Delphi it was suggested that an individual has two facets of critical thinking: disposition and skill. Together, the two factors provide educators with a much more holistic understanding of critical thinking. Over the past decade academics have increased attention to the dispositions of critical thinking as a means for developing students' capacity for critical thinking (Ennis, 1991; Esterle and Clurman, 1993; Facione and Facione, 1992; Paul, 1990; Siegel, 1988; Tishman and Andrade, 1996).

Critical thinking disposition has been characterized as the consistent internal motivation to engage problems and make decisions by using critical thinking (Facione, et al., 1996). Disposition refers to a habit or tendency an individual has toward critical thinking. Facione (1990) refers to the dispositions as "characterizations of good critical thinkers" (p. 11). One recommendation of the Delphi (Facione, 1990) is to develop instructional tools, which cultivate the dispositions, which can in turn lead to the use of critical thinking skills beyond an instructional setting. Ricketts and Rudd (2004) describe three dimensions of critical thinking disposition: Cognitive Maturity, students' predisposition to looking for opportunities to use reasoning; anticipating situations that require reasoning; and confidence in reasoning ability; Engagement, students' predisposition to be

intellectually curious and desire to know the truth; and Innovativeness, students' predisposition to being aware of the complexity of the problems; being open to other points of view; and being aware of their own and others biases and predispositions. (p. 24)

Recently, the University of Florida has created a synthesized version of critical thinking focused on style instead of disposition or skill. The University of Florida Critical Thinking Inventory (UFCTI) is the resulting instrumentation, which addresses an individual's perceptions of their personal critical thinking style. Style is measured on a continuum of Engagement Style and Seeking Information Style (Lamm and Irani, 2011). Individuals who possess an engagement style are often aware of their surroundings and are able to anticipate situations where reasoning will be required. They are often confident in their reasoning ability and enjoy solving problems and making decisions. On the opposite spectrum, those individuals demonstrating the seeking information style are considered "hungry learners" and are often looking for new knowledge and information. They are capable of seeing the world as complex and are aware of their own biases and predispositions (Lamm and Irani, 2011). Together, these two styles represent the breadth of critical thinking style that individuals may express.

Critical Thinking Instruction

Smith (1981, as cited in Machemer and Crawford, 2007) concluded that three specific teacher behaviors significantly improved students' critical thinking. Those behaviors are supporting the student; include student participation during class sessions and building relationships with students in the course. Today's active learning techniques encourage the goals and objectives of higher education and help students understand diverse and differing viewpoints and ways of knowing, in addition to fostering cross-disciplinary interactions (Machemer and Crawford, 2007).

To encourage this type of teaching more student-centered approaches are necessary. Historically, teacher-centered teaching referred to a lecture based approach whereas student-centered teaching involves an active and/or cooperative learning process. Active learning does not disregard the lecture approach entirely, but it encourages the inclusion of individual and group application during class. Jungst et al. (2003), Johnson et al. (2000) and Millis and Cottell (1998) noted, "*Research has reported on the values of active learning, including the opportunities and the challenges from a teacher and institutional perspective*" (as cited in Machemer and Crawford, 2007, p. 10).

However, research on student perceptions of active learning opportunities and settings is limited and contradictory (Machemer and Crawford, 2007). Machemer and Crawford (2007) researched students' value level regarding active, cooperative and traditional teaching methods. Active teaching is student participation in class where cooperative learning is student participation with other students. High achieving students were the most reluctant concerning cooperative learning techniques because they are comfortable and successful under the teacher-centered course structure (Felder and Brent, 1996; Peterson, 2004). Machemer and Crawford (2007) found that students want to take an active approach to learning but they do not want to be responsible for their peer's learning. These results can be accredited to the fact that students are very accustomed to the well-established lecture style teacher and prefer their obscurity in the classroom to interactive learning.

Other factors to consider when analyzing a student's critical thinking style and abilities are, peer influence outside of the classroom, student demographics and study habits. "*Even with precollege critical thinking controlled, students' out-of class experiences contribute as much to gains in critical thinking as did students' class-related experiences*" (Terenzini, et. al., 1995). Students with more competition-oriented friendships make more significant gains than those with supportive, coddling friends.

Also, the number of hours students spent studying and the number of non-assigned books students read during the year were all significantly and positively related to first-year gains in critical thinking" (Terenzini, et. al., 1995, p. 34). "*Huxham (2005) noted 'student evaluations, on their own, do not provide sufficient grounds for changing teaching practice…what students want may not be what is pedagogically best'*" (p. 27) (Machemer and Crawford, 2007).

Critical Thinking Instruction Online

Current research on critical thinking in the online educational environment has focused heavily on methods to support critical thinking with less attention to the cognition behind critical thinking. Several studies examine a particular method or approach to fostering critical thinking in the online classroom and identified practical applications for professors and instructional designers (Barber, 2011; Carter and Rukholm, 2008; Chann-Ru, 2012; Frey, 2011; Kurubacak, 2007; Pena and Almaguer, 2012; Richardson and Ice, 2010; Sharma and Hannafin, 2004). A synthesis by Maurino (2007) found contradictory findings in the literature on critical thinking skills in online discussions and listed alternative methods (e.g. group work, case studies and problem based learning activities) to achieve these instructional goals. While these approaches provide a wide variety of best and worst practices for developing critical thinking skills online, we turn to how students' perceptions influence their performance on these tasks.

The research that examines individuals' perceptions in the online learning context has demonstrated a connection between personal satisfaction and self-concept with performance of critical thinking skills (Hamann, 2012; Wang and Pei-Yi, 2008; Yang and Chou, 2008). Of particular interest in this line of inquiry is the work of Wang and Pei-Yi (2008), which found that self-efficacy predicted student use of critical thinking

strategies and students with high self-efficacy used more high-level strategies. Exploring this connection between self-perception and its impact on the quality of thinking and learning skills is truly important when considering the student in designing instruction.

The challenges for instructors to build capacity for critical thinking then must become two fold, instructors must appreciate the natural critical thinking style of students, but also the impact of the extent to which specific strategies are utilized to encourage critical thinking. Understanding has to be in tandem, instructors must be explicit in exploring both how students think critically and the quality of their instruction.

Purpose

The purpose of this study was to determine if a student's self-perceived critical thinking style influenced his/her perception of critical thinking instruction examining both face-to-face delivery and online delivery. The objectives of the study set forth to guide this study were to determine:

1. Critical thinking style of students as identified by the UFCTI,
2. Change in critical thinking style of students as identified by the UFCTI and
3. Students' perceptions of the extent to which critical thinking was taught in the course.

Methods

This study was conducted as part of a course evaluation process designed for the Scholarship of Teaching and Learning (SoTL). The survey research methodology utilized three short questionnaires to assess students' critical thinking style, evaluation of the course (critical thinking emphasized) and demographics. This was a non-experimental causal comparative design. The face-to-face course took place during the fall 2011 semester and the online instruction was during the summer 2012 semester at a large land grant institution in the south. The course used in the study was an undergraduate introductory leadership course with the core objective to educate students about the breadth of leadership theory. The face-to-face course was moderate sized (106 students) and the online delivery was smaller with only 36 students enrolled. The Institutional Review Board (IRB) approved this study prior to any data collection and the research protocol was approved (2011-U-1225).

The instructor created the course curriculum, assignments and activities with the guidance Beyer's (1987) approach to teaching thinking framework. For the introduction stage, the instructor created and delivered (both face-to-face and online) a 50-minute lecture covering the basic definitions, dispositions and skills of critical thinking. The importance and relevance of critical thinking to leadership and higher education is outlined as part of this process. Guided practice is integrated through course discussions (discussion board in online course) and activities (web-based work in online course). Further,

independent application was accomplished through their written papers over the course of the semester. Because the intent of the course is to provide the students with a survey of research theory, the instructor chose to focus on the stages emphasizing a singular application of critical thinking instruction (although, it would be hoped that the students personally experienced transfer and elaboration, as a result of the course). The course syllabus is available for a more detailed examination of the elements represented in each stage.

The population of the study included all students enrolled in the course over a two-semester period. The face-to-face data collection used a convenience sample of those students attending on the final day of the course (n=89), while all students in the online delivery course were invited to participate (n=36). Students were not required to complete the assessments and all participation was voluntary. The population of the course was a mix of students ranging in classification from freshmen (1) to senior (4), with 8 colleges represented and 27 different majors. In general, the course demographic aligns with the institution, with a majority of the students being Caucasian/white females.

To collect the necessary data, researchers used three existing questionnaires. To measure critical thinking style, the UFCTI (Lamm and Irani, 2011) was employed. This instrument measures students' self-perceived critical thinking style and is an adaptation extending work previously completed on critical thinking disposition (UF/EMI, Friedel et al., 2008; Lamm et al., 2011). The UFCTI focuses on an individual's range of critical thinking style anchored between Engagement style and Seeking Information style. The instrument, which is 20 items long, includes a Likert-type scale of Strongly Disagree (1) to Strongly Agree (5). Of the 20 questions, 13 individual items measure Seeking Information and seven items measure Engagement. While there are two individual scales, scores are derived as a total score and range from 26-130. The Engagement scale is shorter in length, and because of this, scores are weighted during scoring by 1.866 (Lamm and Irani, 2011). To interpret scores, respondents with a total score 73 or above may be identified as "Seeker" and 72 or below are considered to be "Engagers" (Lamm and Irani, 2011). Established reliability for the UFCTI is as follows: Seeking Information α=0.80, Engagement α=0.80 and the total UFCTI α=0.87 (Lamm and Irani, 2011). Post-hoc analysis of reliability is provided later in the manuscript.

The CTI was administered using a post-test followed by a retrospective pre-test (postthen) design (Rockwell and Kohn, 1989). This design allows researchers to administer a pre-test following the intervention to correct for any, "limited knowledge in responding accurately to the questions being asked on the pretest" (p. 1). This "post-then-pre" design allows respondents to accurately gauge their learning by assessing post-test scores first followed by pre-test responses.

The course evaluation component was designed using the Foundation for Critical Thinking's Course

Evaluation questionnaire. The intent of the evaluative form is to, "provide evidence of whether, and to what extent, students perceive faculty as fostering critical thinking instruction (course by course)" (The Critical Thinking Community, 2011, 5, item 1). Using a Likert-type scale ranging from Low Score (1) to High Score (5) students are asked to individually score 20 questions regarding course instruction. Examples of questions include: "To what extent does your instructor teach so as to enable you to think more accurately," "To what extent does your instructor teach so as to encourage critical thinking in the learning process," and "To what extent does your instructor teach so as to help you learn how to understand the key organizing concepts in the subject?" The range of scores is 20 to 100 with a mid-range break of 60 separating low and high scores. The Foundation for Critical Thinking does not provide any established psychometrics for this instrument. The research team evaluated the items for construct and face validity. Reliability was established post-hoc and is provided later.

While the face-to-face course utilized face-to-face data collection procedures, the online course utilized electronic data collection after the completion of the course. Using the Tailored Design Method (Dillman, 2009) students enrolled in the online course was invited to participate in the study using a 5-point contact strategy. This included a pre-notice, notice, reminder, follow-up and study closure. The instruments were adapted for web-based administration using Qualtrics. Data collection took place over six weeks following the course.

Due to the descriptive nature of the study, the researcher reported mean scores and standard deviations for each of the outlined objectives. The researcher used SPSS© to organize and analyze the data.

Lastly, the study participants were asked to complete a short demographic instrument to elicit the following information: age, gender, race/ethnicity, major and whether or not they had any previous experience or coursework emphasizing critical thinking.

Findings

The following findings represent data collected and analyzed with the purpose of completing each objective of the study. For the face-to-face data collection there were 106 individuals in the representative convenience sample on the day the questionnaires were administered. Of those, there were 89 respondents for a response rate of 84%; however, the total useable number of questionnaires completed was 77. The online administration yielded a smaller response with only eight respondents. In order to address the smaller response rate for the online administration, non-response was controlled for using a comparison of early and late respondents (Lindner, Murphy and Briers, 2001). Post hoc reliability analysis for the CTI confirmed appropriate reliability coefficients for the scales with the following results: CTI pre-test $\alpha=0.90$, CTI post-test $\alpha=0.90$ and the Course Evaluation $\alpha=0.95$.

The demographics are provided as a framework for understanding the nature of those individuals who responded. Of the 77 useable responses received, 31% (n=24) were male and 69% (n=53) were female. Further, ages ranged from 18-31 with the average being 21, SD=1.7.

The racial/ethnic make-up of students was largely Caucasian (n=54, 70%) with the next largest group being Hispanic (n=15, 20%). The remainder of the student racial/ethnic background accounted for 10% (n=6). There were a total of 28 different majors identified with the majority being Agricultural Education and Communication (n=17, 22%) followed by Accounting (n=13, 17%).

The intent of the first and second objectives was to determine the critical thinking style of students as identified in the UFCTI. To accomplish this objective students were given a post-test of their perceived critical thinking skill followed by a retrospective pre-test (post-then). Scores for the respondents were broken down into three scores: a pre-test CTI score, a post-test CTI score and a change in CTI scores. The total pre-test scores for respondents ranged from 41-99 points with a mean score of 78.68 (F2F) and 82.31 (online) with standard deviations of 9.95 (n=69) and 8.96 (n=8). Post-test scores ranged from 40-99 points with a mean score of 82.31 (F2F) and 89 (Online) with standard deviations of 8.96 and 3.34 respectively.

The pre-test mean scores indicate that respondents self-perceived their critical thinking skill as "seeker." Post-test scores indicate a strengthening of the seeker skill set. The change in scores showed that on average (mean) respondents moved 3.82 (F2F) and 10.62 (online) points with standard deviations of 6.60 (F2F) and 6.52 (online). Table 1 represents these figures.

Table 1. Self-Perceived Critical Thinking Skill Scores of Respondents (n=68)						
Testing Pair	M		SD		Std. Error Mean	
	F2F	Online	F2F	Online	F2F	Online
Pre-Test	78.68	78.38	9.95	5.88	1.21	2.08
Post-Test	82.31	89.00	8.96	3.34	1.10	1.18
Change in CTI	3.82	10.62	6.60	6.52	.80	2.31

The third objective was to determine students' perceptions about course instruction as it relates to emphasizing critical thinking. Findings showed a range of 38 points in relation to perceptions of critical thinking skill with a minimum of 47 and a maximum of 85. Respondents indicated a mean score of 83.81 (F2F) and 84.25 (online) with standard deviations of 11.72 and 13.71 respectively, which shows high-level perceptions of critical thinking instruction integration.

Recommendations/Implications

Because of the nature of the limitations associated with this study, mainly the small rate of response in regards to the online sample, it is suggested that the recommendations provided below, be applied only to those in this study.

Objectives 1 and 2

This objective was used to determine the critical thinking style of students as identified in the UFCTI. The pre-test portion of objective one showed the most common participant critical thinking style to be "seeker" for both the face-to-face and online courses (M=78.68/78.38). The post-test portion of objective also showed gains in "seeker" behaviors with both the face-to-face and online courses showing positive change for stronger "seeker" behaviors (M=82.31/89.00). The computed differences were M=3.82 for the face-to-face instruction while the online instruction was M=10.62.

This change between the pre and post-test scores resulted in practical differences between the two sets of scores. Researchers believe this to be encouraging in relation to student perception of instructor level of critical thinking instruction. There are many implications that go along with these results. "Seekers" are different from "engagers" in that they seek opportunities to use their reasoning skills, while engaging behaviors require anticipating situations and confidence in those skills. "Seekers" can encourage instructors to increase their levels of critical thinking in their classroom instruction.

The researchers reflected on why the online course would have experienced greater gains than the face-to-face. One potential reason may be that in an online course the learners are expected many times (and particularly in this study's course) to be more self-directed utilizing external research tools on their own. The face-to-face students are provided consistent access to the instructor and TA's during instruction time and there is not the same emphasis on searching out information on their own, as in the online course where physical distance plays a key role in proximity and accessibility to instructor resources.

Further, the challenge becomes determining which of the styles is at an advantage for different types of activities. Students who are "seekers" may have a different level of awareness, but if we, as instructors, cannot encourage their confidence in their reasoning abilities, nor the ability to anticipate these situations, then what is the transferability of the critical thinking instruction?

Objective 3

This objective was to determine students' perceptions about course instruction as it relates to emphasizing critical thinking. In relation to course instruction, student perceptions were very high, with a means of 83.81 (F2F) and 84.25 (online) out of 85 possible points. This number is very encouraging for the instruction of the course in the study. Students' showed that they believe there is a high integration of critical thinking in the course included in the study. An implication of this result is that the instructor is high in critical thinking ability, which may translate to high integration in the class. Another implication is that the "seeker" style critical thinker may extract more critical thinking implications than "engager" style critical thinkers. The issue remains, are there untapped opportunities to

encourage students to strengthen their "engaging" style of critical thinking.

Conclusions

Overall, this study showed what researchers anticipated as a result of explicit critical thinking instruction in an undergraduate course. Specifically, the instructor of the course used, showed high integration of critical thinking skills and this was displayed in participant pre and post-test scores for both groups. Critical thinking is an important component that many employers are searching for in their potential employees, so critical thinking integration in the classroom is a great start to nurturing the critical thinking skills of students (McMillan, 1987).

It is shown that explicit instruction, including Beyer's introduction stage, sets the framework for the students learning of critical thinking. This contrasts some approaches to critical thinking instruction, which fail to introduce and simply embed the instruction. Using the framework provided the instructor with a specific strategy to build capacity for critical thinking.

Also, the "seeker" style critical thinker was shown to be the majority in this study. Again, the potential reasons for such a great gain in seeking behaviors on behalf of the online course could be due to the greater opportunities to use seeking information (active learning) behavior within the course (Machemer and Crawford, 2007). Further research needs to be done to determine if instructors should be catering to a specific style of critical thinking when teaching certain courses. Researchers strongly encourage further research to be performed to determine if other instructors show high integration of critical thinking components in their classes and to determine if a certain critical thinking style is the majority in certain college majors. This could be clearly an indication that students do experience higher levels of self-efficacy gains when their thinking has been challenged, as is many times with critical thinking instruction (Terenzini et al., 1995). Explicit instruction in the area of critical thinking exposes students to the nuances of the behavior, which promotes the awareness of critical thinking expectations during the course. The more generalized these results can become, the better. Learning what types of students there are and how they perceive critical thinking integration in the classroom will lead to more effective teaching methods. These effective teaching methods may increase the critical thinking ability of graduates, which is what employers are looking for in college graduates.

Recommendations

A number of research and practice recommendations can be drawn from this study. These are outlined below and include:

Research
- Examine through an experimental design the impact of Beyer's framework for teaching thinking

Getting it to Click

- Expand the number of respondents in the online format
- Identify any differences in demographics related to gender and age
- Describe the role of the instructor's readiness to teach critical thinking on student critical thinking development
- Introduce difference teaching tools and strategies to examine their impact of student critical thinking development

Practice

- Instructors should use specific frameworks, like Beyer's, to design curriculum to maximize student critical thinking development
- Emphasize more seeking information behaviors in the face-to-face course, in order to encourage students to work independently
- Instructors should continue to develop their understanding of critical thinking to ensure that the introduction stage is relevant

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Integrating Facebook into the College Classroom: Student Perceptions and Recommendations for Faculty

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Abstract

This paper describes how Facebook was integrated into a university course to help students better engage with course material, each other and the instructor. The Groups feature of Facebook allowed students and the instructor to interact and share information with one another on Facebook without having to "friend" each other, allowing each person to maintain privacy over his/her Facebook content. Researchers tracked Facebook activity throughout the semester and conducted a survey with students to better understand their Facebook behavior and perceptions about the use of Facebook as part of the course.

The use of Facebook was optional for students and an alternative for another assignment. Fifty-two of 60 (87%) students chose the Facebook option. Over the course of the semester, students wrote 283 unique posts related to course content, and these generated 840 comments. Findings from the survey showed that many students thought the Facebook Group made a positive impact on their understanding of course concepts, their overall performance and their enjoyment of the course. Moreover, most thought the Facebook Group had a positive impact on their relationship with other students and the professor. Recommendations are provided for faculty interested in using Facebook in the college classroom.

Introduction

As students and technology evolve, educators continuously strive to engage students with course material and improve the educational experience of students in colleges of agriculture. Technology in particular has dramatically impacted the educational experience across North America. In today's college classrooms, educators providing traditional instruction from the front of the room are likely to see the backs of laptops, with the hope that students are engaging with course material. Many educators understand the potential of technology to positively impact classroom learning,

however, many still hesitate to use available technology to enhance pedagogy. A 2007 report on the educational use of technology (Kleiner et al., 2007) concluded that faculty reluctance was a major impediment to integrating technology into course material.

Although technology has influenced many aspects of education over the past 20 years, arguably no technology has had more impact than the Internet. In the early 2000's the term "Web 2.0" was coined to describe the evolution of the Internet from a static repository of information to a dynamic and interactive platform for collaboration using web functions such as wikis, blogs, media sharing and social networking sites. The continuing evolution of the Internet in the days of Web 2.0 offers opportunities for communication and information exchange that would have been unimaginable by most people just 15 years ago. Perhaps more than any other site, Facebook exemplifies this phenomenon. With 1.15 billion active users (Facebook, 2013), Facebook offers an incredibly efficient medium for sharing written, photographic, audio and video information. Moreover, ever since its origin in 2004 as a website exclusively for college students, large numbers of young people have adopted Facebook as their choice of social networking tools. In a large study of over 36,000 college students from the U.S. and Canada, Smith and Caruso (2010) found that just over 90% of college students use online social networking sites, and of these, 97% use Facebook. With tremendous potential for information sharing and such high penetration among college students, some educators have begun exploring whether they can use Facebook to improve the pedagogical objectives of their courses.

Research into the use of social media to enhance education is in its infancy, but studies have begun to appear in the literature and generally show positive potential for the pedagogical use of social media. Studies have investigated topics such as student use of Wikipedia for coursework (Head and Eisenberg, 2010), faculty use of YouTube (Burke et al., 2009), Second

Life (an online virtual world simulation) (Holmberg and Huvila, 2008) and Facebook (Mazman and Usluel, 2010) as teaching tools. These studies all show support for the promising use of these media as pedagogical tools. Other papers have discussed the merits of social media in education by highlighting their ability to facilitate interaction, collaboration, active participation, information and resource sharing and critical thinking (Ajjan and Hartshorne, 2008; Mason, 2006; Selwyn, 2007). Lee and McLoughlin (2008) add that social media is an effective teaching tool because it can help build social support, increase connectivity and promote collaborative content creation. Regarding Facebook, Mason (2006) points to the platform's beneficial qualities such as enabling peer feedback, goodness of fit with social context and interaction tools. Higgins et al. (2013) explain that these aspects of social media may promote constructivist pedagogies because they actively engage students in the educational process and facilitate social interaction, both considered to be important components of constructivist learning.

In addition to the pedagogical merits of social media, students seem to want to see social media integrated into their educational experience. According to Roblyer et al. (2010), students are more interested in the educational use of Facebook than faculty. This finding is not surprising since there has been evidence that students who corresponded with their professors via email experienced improved relationship with them and that email "allows them to more freely express their ideas to professors" (Jones, 2002, p. 9). Moreover, contrary to the belief of some faculty (Junco, 2012), 85% of students would not feel that their privacy is being invaded by faculty who encourage the educational use of Facebook (Roblyer et al., 2010). In fact, Mazer et al. (2007) found that students who experienced more self-disclosure from faculty on Facebook reported more motivation and higher levels of learning.

Despite the willingness of students to incorporate Facebook into their coursework, very few faculty appear to be doing so. Moran et al. (2011) found that 77% of faculty reported using social media in their personal lives, yet only 4% had incorporated Facebook into their courses. Given the pedagogical potential of Facebook, its lack of adoption into the classroom is interesting especially given that faculty are using other types of technology to communicate with students. According to Jones and Johnson-Yale (2005) 92% of faculty correspond with students over email and 55% have course websites. If Facebook represents an advancement over these older technologies with regard to communication and information sharing, and a high percentage of students use Facebook daily and are willing to use it as part of their coursework, why haven not more instructors incorporated it into their courses? One possible reason is that many faculty members are not sure how to incorporate Facebook into their courses, and because social media is still relatively new, there are few resources available to help guide faculty who

might otherwise be interested. The purpose of this paper is threefold: 1) to present a case in which Facebook was incorporated into a college course including the way it was used in the curriculum; 2) to present the results of Facebook activity in the course throughout the semester; and 3) to present the results of a survey with students about their use and experience with Facebook as part of the course. This paper will include recommendations for faculty interested in incorporating Facebook into a college course.

Methods

The methods for the material presented in this paper took three forms. First, observation notes were taken throughout the semester by the first author who implemented Facebook into the curriculum of a 200-level course in the College of Agriculture and Natural Resources (CANR) at Michigan State University. The course, Introduction to Travel and Tourism, had an enrollment of 60 students. Although the instructor conducts agritourism research, the focus of the course was on tourism, so many of the students were not CANR majors, but instead were taking the course as an elective. The observation notes included initial considerations about how to integrate Facebook into the course, such as whether to require students to participate, which Facebook features to use and whether (and how) to grade students' Facebook activity.

Second, Facebook activity was tracked throughout the semester for quantity and quality. To assess quality, each post and comment was given a quality score that ranged from one to three. Regarding student posts, most scored at least a two, but received a three if it was particularly relevant to course material. As for comments, a short comment such as "interesting post" or "lol" (laugh out loud), would earn a score of one. A score of two would be awarded for a comment that was more thoughtful, but generally short. Comments that were thoughtful and longer than a sentence, or advanced an ongoing discussion (either online or from class), were given a score of three. To minimize the impact of this subjective assessment, each comment and post was assessed and tracked by both the course professor and a graduate teaching assistant. Students' total scores for their Facebook activity were based on the average of the total score by the two raters. For the analysis of the Facebook activity, all posts were also categorized by type of post (e.g., linked article, photo, question, etc.). Descriptive statistics were calculated for all Facebook activity such as average number of posts and comments (overall and per student), the types of posts and average number of comments per post.

Finally, a paper-based survey was developed and distributed to students in class two days before the end of the semester. The survey included items to assess students' typical use of Facebook, student Facebook behavior as part of the course and their opinions about the use of Facebook as part of a university course. Descriptive statistics were compiled for the survey

results. This survey study was deemed exempt by the MSU institutional review board.

Results and Discussion

The findings for this paper are grouped into three areas that reflect the methods described above: 1) a description of how Facebook was integrated into a university course; 2) the Facebook activity associated with that course; and 3) a short survey study of students in the course regarding their Facebook activity.

Integrating Facebook into the Course

Several factors led to the decision to use Facebook as part of the course. First among these is that the Internet provides access to a significant amount of course-related material that is worth sharing with students, including articles, photos, videos and blogs. For years, the instructor shared some of that material with students either in class, through email or via web-based course management software such as Blackboard, WebCT or ANGEL. Although these may have been an effective method for dissemination, it was not necessarily a great way for students to engage with the material. Using Facebook would have several advantages over using course management software. For example, students familiar with how to post new material using Facebook commented on and engaged in "discussion streams" through the Facebook Group page. Additionally, most students used Facebook at least once per day, with many using it several times throughout the day. Finally, Facebook offers the opportunity for students uncomfortable speaking up in class to engage in course-related discussions and provides an easy way for instructors to share interesting material that students find and pass on to the instructor.

Because of its potential to improve student engagement and learning, the instructor decided to experiment with Facebook as part of the course. Several fundamental questions became apparent. Should the instructor "friend" students on Facebook? Should the students be required to participate? Would their participation be graded, and if so, how? After investigating options and considering alternatives, the instructor set up a Facebook Group for the course and acted as the group administrator, inviting students as members of the group. Using Facebook Groups allows students and faculty to interact and share information with each other without creating faculty-student friend status, thus allowing students and faculty to keep their Facebook content private. Another advantage of Facebook Groups is that it shows who has viewed a post regardless of whether they commented or liked the post.

The Facebook assignment was worth 10% of each student's grade. Student participation was optional, and the instructor provided an alternative assignment that was also worth 10% of the overall grade. The optional assignment required students to write two short (one-page) summaries and analyses of trade and popular press articles relevant to the course content. Students who participated in the Facebook option received a grade for the quality and quantity of their Facebook activity. A score of 21 (seven high quality posts, 21 low quality ones, or any mix of quantity and quality) was required for a 4.0 for this assignment. Of the 60 students in the course, 52 selected the Facebook option (87%), and three of those who did not select this option still joined the Facebook Group and participated in discussions. None of the students had ever taken a course that used Facebook.

There was concern about the amount of time the instructor would need to invest to spark Facebook activity, however, student participation began almost immediately, as students began to make posts and comment on each other's posts. Within one week of the Facebook Group's establishment, 32 different students had made 57 separate posts, each of which was viewed by an average of 42 students. These posts generated 192 separate comments from 38 different students with approximately 40% of the comments consisting of thoughtful responses that were comprised of multiple sentences.

Some of the comments and posts were tangentially connected to the content of the course. For instance, many people used the page to share photos and stories of some of their travels. Although some posts were not directly related to course content (even for a tourism course), they seemed to be useful at helping students make a connection with one another and helped to develop a sense of community among the students. One particular observation was that many of the international students in the class (27% of all students) shared information and photos about their home countries or cities. These often generated comments and questions from American students and seemed to help break down many of the barriers that exist between international and domestic students. Only one comment was deemed inappropriate and the instructor addressed the situation immediately.

Another concern was that using Facebook would reduce in-class discussion. In fact, Facebook posts often provided good examples and stimulated class discussion. The instructor often highlighted students who provided particularly interesting or relevant posts or comments, and ask them to provide explanation to further topic discussion. The Facebook Group allowed students an opportunity to voice their opinion and participate in discussion in a safe environment when they otherwise may not have done so in a formal dialogue setting.

Facebook Activity

The amount of activity generated in the Facebook Group far exceeded the expectations of the instructor. Over the course of the semester, 49 different students made 283 different posts, which represented an average of 5.7 posts per student. The instructor made a total of 19 posts over the course of the semester. A total of 52 different students made 840 comments for a mean of 16.5 comments per student.

As mentioned above, each post was placed into one of 9 different categories. Table 1 shows the number of posts for each category as well as the mean number of comments for each type of post. Links to articles were by far the most common type of post. Not surprisingly the posts about course information generated the fewest number of comments as these were all posted by the instructor and were meant to be announcements, rather than an attempt to spark a discussion. Each of these informational posts were viewed by all 55 students who were members of the Facebook Group, suggesting that Facebook is an effective way of disseminating information to group members. The posts that posed a question to the class (all but two of these came from students) generated the most comments.

Student Survey

A total of 54 students completed the survey. For most students, the course did not have a great impact on their overall use of Facebook. Only four students reported not having a Facebook account before the course started, and each of those was a first-semester student from China, where Facebook was prohibited at the time. Most students (76%) reported using Facebook about as often at the time of the survey as before the course began, and 13% reported using Facebook less often before the course. Most of the students were experienced users of social networks before the course began with 87% reporting they had been using social networks for more than 2 years. Regarding frequency of use, 83% reported checking Facebook more than once per day, with about half the students (49%) checking their Facebook account five or more times per day. More than 75% indicated that they use social networks for more than 20 minutes per day.

Privacy was one reason the instructor did not require the use of Facebook. Although a Facebook Group does not give members access to each other's private Facebook content, many students have weak privacy settings. The instructor was concerned that students with weak privacy settings might be concerned that interacting with non-friends (the professor and other students) as part of a Facebook Group might provide an easy opportunity for others to link to their Facebook content. Privacy did not, however, seem to be a concern for most students. When asked about the extent of their concern with the professor and other students viewing their Facebook content both before they began the course and at the end, most students indicated they were "not at all concerned" about others seeing their content and at the end of the semester even fewer had concerns than at the beginning (Table 2).

Students were asked on the survey whether they became Facebook friends with other students in the course and 47% (including 73% of international students) had become Facebook friends with someone from the course, and 30% (and all of international students) had become friends with more than one student from the course. Students were also asked about the impact the Facebook Group had on their relationship with other students, and although 55% indicated it had no impact, 45% indicated it had either a "positive impact" or a "strong positive impact." No students indicated that the Facebook Group site had a negative impact (Table 3). A similar question was asked about the Facebook Group's impact on the student's relationship with the instructor and had very similar results (Table 3).

To better understand student perceptions of the Facebook Group as a pedagogical tool, the survey included several items related to their Facebook activity, as well as the content itself. Students were asked what percentage of the posted links they followed and what percentage of posts and comments they read. Almost 60% of the students read more than half of the posts, 36% followed more than half of the posted links and 32% read more than half of the comments (Table 4). Students were also asked what percentage of the content generated by the Facebook Group was relevant to the course content, and the vast majority (64%) indicated that at least 76% of the content was relevant to the course (Table 5). Another

Table 1. Categories of Posts to Facebook Group

	Number of Posts	Mean Number of Comments per Post
Course Information	5	0.2
Question to others	24	9.8
Link to Website	49	2.1
Link to Article	125	2.7
Personal Photo	39	3.4
Discussion about Material from Course	9	3.9
Statement	3	2.3
Video	46	2.4
Other	2	2.0
Total	302	3.2

Note: Data is from Introduction to Travel and Tourism a 200-level course with 60 students taught in the 2012 fall semester at Michigan State University.

Table 2. Students' Concerns about Facebook Privacy

	Very Concerned	Somewhat Concerned	A Little Concerned	Not at All Concerned
Concerned about content being seen by professor				
Before Course	3.8%	11.3%	26.4%	58.5%
At End of Course	10.9%	6.5%	13.0%	69.6%
Concerned about content being seen by other students				
Before Course	0%	17.0%	13.2%	69.8%
At End of Course	4.3%	6.4%	19.1%	70.2%

Note: Data is from Introduction to Travel and Tourism a 200-level course with 60 students taught in the 2012 fall semester at Michigan State University.

Table 3. Impact of Facebook Group on Student Relationships with Others

	Strong Positive Impact	Positive Impact	No Impact	Negative Impact	Strong Negative Impact
Relationship with other students	13%	32%	55%	0%	0%
Relationship with professor	15%	30%	55%	0%	0%

Note: Data is from Introduction to Travel and Tourism a 200-level course with 60 students taught in the 2012 fall semester at Michigan State University.

survey item asked students whether they would have used the Facebook Group as much if it had not been part of their grade. The majority (64%) indicated that they would have used the Facebook Group

Table 4. Student Activity with Facebook Group Content						
	0%	10% or less	11% - 25%	26% - 50%	51% - 75%	76% or more
Percentage of Posts Read	0%	11%	6%	23%	36%	21%
Percentage of Links Followed	0%	13%	17%	32%	21%	15%
Percentage of Comments Read	0%	23%	21%	24%	26%	6%

Note: Data is from *Introduction to Travel and Tourism* a 200-level course with 60 students taught in the 2012 fall semester at Michigan State University.

less often if it had not been part of their grade. This finding reinforced the instructor's feeling that students would be less likely to use the Facebook Group if it was not required.

When asked about how the Facebook Group impacted aspects of the course such as enjoyment of the course, understanding of course topics and their course performance, students generally felt the Facebook Group made a positive impact (Table 6). A total of 57% indicated the Facebook Group had at least a positive impact on their class performance, while 40% indicated it had no impact. About three quarters of students felt the Facebook Group had at least a positive impact on their understanding of course concepts and 90% said it had at least a positive impact on their enjoyment of the course. When asked whether they would recommend a future student to join the Facebook Group, 100% of those who answered the question indicated they would. Seven students did not answer the question.

Table 5. Percentage of Facebook Group Content That Is Relevant to Course Conent					
0%	10% or less	11% - 25%	26% - 50%	51% - 75%	76% or more
0%	4%	0%	11%	21%	64%

Note: Data is from *Introduction to Travel and Tourism* a 200-level course with 60 students taught in the 2012 fall semester at Michigan State University.

Table 6. Impact of Facebook Group on Aspects of Course					
	Strong Positive Impact	Positive Impact	No Impact	Negative Impact	Strong Negative Impact
Enjoyment of Course Material	28%	62%	10%	0%	0%
Understanding Course Topics	10%	64%	26%	0%	0%
Course Performance	4%	53%	40%	2%	0%

Note: Data is from *Introduction to Travel and Tourism* a 200-level course with 60 students taught in the 2012 fall semester at Michigan State University.

Summary

Although the use of Facebook described in this study was an experiment, the level of participation was significantly higher than expected. Students also seemed more engaged in the material than in previous semesters when Facebook was not part of the course, and students appeared genuinely excited to find relevant resources to post. The Facebook Group also seemed to be a useful tool for encouraging student interaction with each other and with the instructor, and survey results supported this observation.

One challenge from an administrative perspective is with the tracking of student participation, which is an especially difficult endeavor with larger class sizes. However, it is with these groups that Facebook is perhaps most valuable given the opportunities for engagement, participation and interaction, which are sometimes more difficult to elicit with large class sizes. Tracking only the quantity of each student's activity, and not the quality, would be easier, but might result in an overall decrease in the quality of the generated content. Focusing only on the quality might discourage the seemingly vacuous activity (e.g., likes, lol), but these too are important in order to make the Facebook Group seem genuine, natural and fun.

Time will tell whether Facebook will maintain its level of popularity among college students in the years to come. Facebook has, in fact, begun to see a decrease in use among teenagers (Bercovici, 2013). However, if the

60 students in this course are any indicator, Facebook currently enjoys very high participation rates among this group and Facebook Groups offers several potentially effective features to uniquely engage students in course material and provide opportunities for participation and interaction that might not otherwise happen in the university classroom.

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Graduate Perceptions of Academic Advising in the College of Agricultural and Life Sciences at the University of Idaho

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Abstract

Information from graduates from the University of Idaho College of Agricultural and Life Sciences (CALS) was gathered to make informed decisions regarding coursework, recruitment, enrollment, employment assistance and academic advising. CALS chose to attend the university based on recommendations from their parents and from visiting the campus for activities such as 4H and FFA activities. CALS graduates endorsed their decision to enroll at the University and the initial major they selected. College academic advisors were rated between average and good, but no significant differences were identified across departments within the college. Advisors were described as professional, approachable, friendly and available to advisees. Agricultural education graduates indicated significantly the most positive perceptions regarding job placement advising, career advising, student teaching/internship advising and employment opportunities after graduation when compared to graduates from other CALS departments. Maintaining quality advising in all aspects of the university education will assist in retaining students as well as recruiting additional students into the college and university.

Introduction

The Morrill Act defined the role of land grant institutions and has been consistent in its mission since its adoption in the 1800s (Gordon, 2008). Historically, stakeholders have become separated from the land grant mission (Silag et al., 1998). This disengagement fostered the inclusion of required stakeholder input regarding research, Extension and education in the 1998 Farm Bill. The change in the Farm Bill also prompted landgrant institutions and researchers to expand and develop new models for gathering stakeholder input (Guba and Lincoln, 1989; Kelsey and Mariger, 2003; Kelsey and Pense, 2001). A variety of studies have been conducted to collect input and perceptions from students, alumni and supporters regarding land grant performance and agendas (Abrams et al., 2010; Kelsey and Mariger, 2003; Kelsey and Pense, 2001). It has been imperative to include stakeholders, such as alumni, in the decision making processes within land grant institutions and CALS. However, information dissemination from Colleges of Agricultural and Life Sciences to their stakeholder groups can be problematic (Kelsey and Mariger, 2003). Although many studies have been conducted regarding graduate perceptions on specific majors within Colleges of Agriculture (Birkenholz, 1986; Hemp, 1974), others have been inclusive of the entire college (Mosman, 1987; Osmond et al., 1998).

Undergraduate follow up studies have been conducted at a variety of institutions nationwide to assess the perceptions of alumni toward educational preparation, quality of instruction, academic advising and extracurricular activities (Osmond et al., 1998; Suvedi and Heyboer, 2004). The perceived effectiveness of academic advising was also a key assessment in graduate followup studies. The majority of respondents provided positive responses to the academic advising they received from Michigan State University, but over 60% of the graduates indicated their academic advisors were of little or no assistance in finding their first job (Suvedi and Heyboer, 2004). University of Florida graduates indicated that their lower division advising was average to poor (71%). However, advising within and specific to their academic majors was rated good to excellent by 65% of graduate respondents (Osmond et al., 1998). At the University of Idaho, academic advising was rated poor to fair, but varied by department, with agricultural mechanization and plant science graduates rated highest, and agricultural economics rated lowest (Mosman, 1987).

Advising is a key component of undergraduate success at the university level, and focusing on the student in advising and learning allows advisors to better serve their advisees. Conceptually, the College of Agricultural and Life Sciences and the University of Idaho as a whole were learner centered and focused on knowledge, collaboration, diversity and creativity

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from the faculty, students and staff (CALS, 2013). By defining learner centered teaching as "optimizing the opportunities for our students to learn", the student focus could be extended into advising, curriculum planning and career placement to help optimize student success (Doyle, 2011). Doyle (2011) reiterated that education was a shared experience, all parties were active participants in an active, collaborative learning environment (Kuh et al., 2010). The strong connection in positive professional relationships among students and faculty fosters a sense of shared learning and leadership (Danielson, 2007) and helped students to develop confidence and work toward making learning more interesting, relevant and socially rewarding (Kuh et al., 2010).

The ideal goal of a quality university experience for students encourages the university to assess all components of the college environment for its enrollees. High quality academic advising has been identified as one of the key quality indicators in the university setting that impacts student perception of the institution and education (CALS, 2013) (Figure 1). Quality education and positive perception from alumni are also impacted by instruction, individual demographics, pre-college influencers, college major, career placement, experiential learning and internship experiences, as well as course content. Overall, these components combine to determine student perception of the university experience. Due to the nature of this framework, CALS can focus on components within the control of faulty and administration in order to create positive recruitment and retention rates in majors throughout CALS and the university.

This study was designed to gather information from alumni to provide departments within the College of Agricultural and Life Sciences with data to make informed decisions regarding courses, recruitment, enrollment, employment assistance and academic advising.

Figure 1. Conceptual Framework for Quality Student Experiences in the University Setting

The purpose of this study was to assess graduate perceptions (1985-2010) of the academic advising provided by faculty in the College of Agricultural and Life Sciences. This purpose directly aligned with the National Research Agenda from the American Association for Agricultural Education Priority Area 5 – Efficient and Effective Programs (Doerfert, 2011). Specifically, the study objectives were to:

1. Develop a profile of CALS graduates (1985-2010);
2. Determine graduate perceptions of the advising quality from CALS faculty; and
3. Compare the perceived quality of advising among graduates based on major, gender and assistance in securing first job after graduation.

Materials and Methods

A web-based survey was sent to all graduates from the University of Idaho College of Agricultural and Life Sciences from 1984-2010. The list of alumni was provided by the university Registrar's office while contact and basic demographic information was provided by the University Alumni office. The study was a continuation of one which gathered similar information from CALS graduates from 1973 – 1985 (Mosman, 1987) and was requested to provide additional information to the faculty and administration in the University of Idaho College of Agricultural and Life Sciences. From 1984-2010, over 1,200 alumni were identified from the college, but the Alumni office only provided 817 email addresses. After three contacts, 495 potential respondents did not respond to the invitation to participate, which may have been attributed to inaccurate email addresses or lack of interest in the study. The final convenience sample size was 322 while 312 responded for a 97% response rate.

The original instrument was developed in 1987 as the result of the efforts of faculty and a graduate student in the Department of Agricultural and Extension Education. The original instrument was reviewed by faculty in the departments of agricultural education, animal science and agricultural economics. The original instrument was field tested by 15 seniors majoring in agricultural education at the time (Mosman, 1987). The current instrument was updated to match majors and activities currently operating within the college. Additionally, dichotomous pairs of statements were presented to the respondents regarding the characteristics of their academic advisors on a Likert-type scale (1 = Strongly Agree, 2 = Agree, 3 = Disagree, 4 = Strongly Disagree). The updated instrument was then reviewed by faculty in agricultural education, agricultural economics and the academic programs office within the college for content and face validity as well as assuring current terminology. The final survey can be viewed online at: http://www.uidaho.edu/cals/ae4hyd/faculty/atouchstone/research.

The University of Idaho Institutional Review Board approved this study protocol and all participants provided written informed consent prior to participation in the study. Control for non-response was addressed by comparing

Figure 2. Most Influential Individuals/Factors on University Enrollment Decisions

Of all the individuals/factors listed below, which was THE MOST influential?

Agricultural and Life Sciences were also assessed. Overall, CALS graduates gave academic advising a rating between average and good. There were no significant differences among departments in overall academic advising (above average rating). Respondents rated their academic advisors based on dichotomous pairs of descriptors. In all pairs, the responses were consistent (positive statements were agreed with, negative statements were disagreed with). No significant variance among responses was identified among departments within the College (Table 1).

early and late responders. The total respondent pool (n=312) was sorted by response date and time and the first half of the responders (n=156) were identified as early responders and the second half (n=156) were identified as late responders (Lindner et al., 2001). No significant differences were found between the two groups (α = 0.05). Additionally, the demographics of the respondents (age, graduation date, gender) were similar to the entire population as described by the registrar and alumni offices.

Results and Discussion

The majority of the graduates from CALS attended the University of Idaho as their first choice (74.5%, n=225) and were still absolutely sure of their decision to enroll at the University (88.6%, n=265) and in CALS (78.9%, n=236). Graduates were still absolutely sure of their choice of major (61.9%, n=185) and their initial career goal (56.4%, n=168). When asked if they would choose the same major today, 85.3% (n=255) responded affirmatively.

Graduates were asked to indicate the most influential person, item or activity in their decision to attend the University of Idaho (Figure 2). Parents were selected as the most influential person(s) regarding university enrollment decisions by 28% of the respondents, followed closely by a visit to the University of Idaho campus for an activity such as Idaho State FFA Career Development Events, Ag Days, or Idaho State 4-H Teen Conference (24%). Aside from parents, the most influential person identified by graduates was their high school agricultural education instructor (13%). This information may provide recruiters, faculty and academic advisors with tools to not only recruit, but also maintain students in the College of Agricultural and Life Sciences.

Perceptions regarding academic advising and the characteristics of academic advisors in the College of

Graduate perception of career placement advice and employment opportunities were assessed on a Likert-type scale (1 = excellent, 2 = good, 3 = average, 4 = fair, 5 = poor). The most respondents were initial majors in the Department of Agricultural Education and 4-H Youth Development (n=105) and had good to excellent (n=55, 52.4%) opinions of the job placement advising provided by the department. Animal and Veterinary Sciences had the next most graduates respond (n=85) but only 29 (34.1%) rated the job placement advising good to excellent. Agricultural Economics and Rural Sociology graduates (n=77) showed a 35% good to excellent rating (n=27) in the same category. Microbiology, Molecular Biology and Biochemistry graduates overwhelmingly rated this category good to excellent (n=5, 83.3%). Conclusions regarding Agricultural Systems Management; Plant, Soil and Entomological Sciences; and Microbiol-

Table 1. Graduate Ratings of Characteristics of CALS Academic Advisors

Characteristic Pairs	N	Mean	Rating
Available	296	1.64	Agree
Unavailable	296	3.29	Disagree
Knowledgable	296	1.71	Agree
Unknowledgable	296	3.33	Disagree
Straightforward	296	1.84	Agree
Ambiguous	296	2.97	Disagree
Reliable	296	1.79	Agree
Unreliable	296	3.35	Disagree
Professional	296	1.63	Agree
Unprofessional	296	3.41	Disagree
Authoritative	296	2.26	Agree
Permissive	296	2.51	Disagree
Approachable	296	1.68	Agree
Unapproachable	296	3.10	Disagree
Organized	296	1.88	Agree
Disorganized	296	3.21	Disagree
Tolerant	296	1.88	Agree
Intolerant	296	3.29	Disagree
Friendly	296	1.63	Agree
Unfriendly	296	3.43	Disagree
Concerned	296	1.78	Agree
Unconcerned	296	3.31	Disagree

ogy, Molecular Biology and Biochemistry departments were difficult to draw due to the small number of respondents (2, 2 and 6, respectively). The scale and raw data shown in Table 2 demonstrate the overall department comparison within CALS.

Graduates perceived that student teaching and internship advising (Table 3) provided by CALS departments were good to excellent (n = 149, 50.7%, $\bar{x}$ = 2.52), employment opportunities after graduation were good to excellent (n = 195, 65.4%, $\bar{x}$ = 2.23) and career advising was average to excellent (n = 245, 83.1%, $\bar{x}$ = 2.65). When comparing by department, no significant differences were identified among graduate departments for academic advising or career advising ratings. However, significant differences (α = 0.05) were noted among departments regarding job placement advising (X2 = 0.005), internship/student teaching placement (X2 = 0.000) and employment opportunities after graduation (X2 = 0.025). Graduates in Agricultural Education and 4-H Youth Development (n=106) overwhelmingly rated student teaching and internship placement as good to excellent (n=77, 72.6%). While on the opposite end of the spectrum, Agricultural Systems Management majors rated internship placement as average (n=2). Conclusions regarding Agricultural Systems Management; Plant, Soil and Entomological Sciences; and Microbiology, Molecular Biology and Biochemistry departments were difficult to draw due to the small number of respondents (2, 2 and 6, respectively). The scale and raw data shown in Table 3 demonstrate the overall department comparison within CALS.

Summary

Graduates from the College of Agricultural and Life Sciences attended the University of Idaho as their first choice of higher education institution and the largest number of respondents initially majored in the Department of Agricultural Education and 4-H Youth Development. At this time, graduates were still confident of their pre-college enrollment decisions such as university choice, choice of major and initial career goal. A majority of graduates (85.3%) stated that they would still choose the same major if they started college today.

As recruitment continues to be on the forefront for higher education institutions, factors influencing enrollment decisions of potential students have become a key issue in recruitment and subsequent advising. Parents were the greatest influence on student enrollment decisions. Outside of family, the largest impact on enrollment decisions was a visit to the campus for any activity. Third highest influencing factor in college enrollment decisions was high school agriculture teachers. When combining the influences of parents, a visit to campus for an activity such as State FFA Career Development Events or 4-H Teen Conference and agriculture teachers, students' likelihood of attending the University of Idaho increased.

Recruitment of students into land grant universities, colleges of agriculture and specific agricultural majors is consistently a concern for agricultural colleges and universities. Noting the importance of influencers on college decisions provides colleges and universities with pertinent information to be utilized in their recruitment and advising efforts. Communicating key information to parents (greatest college decision influencer at 28%), physically bringing student to campus for an activity, especially one related to agriculture (24%) and providing information to agriculture teachers reaches a vast majority of the primary influencers that might encourage students to enroll in the University of Idaho CALS, and specific majors within each department.

Advising was also a key consideration in this study. The largest number of students rated internship advising and job placement after graduation good to excellent, especially within the Department of Agricultural Education and 4-H Youth Development. Additionally, large percentages of respondents indicated good to excellent job opportunities after graduation, especially from the Department of Agricultural Education and 4-H Youth Development which supported previous findings (Mosman, 1987). Additional research is needed to further investigate the differences among departmental responses as this study did not investigate variations across departments within the college.

In addition to considering specific areas of advising, the characteristics of academic advisors within CALS were also assessed. The general consensus of respondents was that academic advising within the college as a whole was average to good consistent with Osmond, et. al (1998) who also found positive perceptions of advising and in contradiction to Suvedi and Heyboer (2004) who found a negative perception of advising. Within the College of Agricultural and Life Sciences at the University of Idaho, academic advisors were almost exclusively academic faculty. CALS did not employ individuals exclusively as academic advisors. Instead, academic advisors also served as academic and research faculty and had responsibilities in all areas of the university experience. This breadth of faculty responsibility may have contributed to the average to good rating of academic advising. Additional training

Table 2. Job Placement Advising Ratings by First Major Department

	AERS	AE4HYD	ASM	AVS	MMBB	PSES
Poor (1)	10	8	0	10	0	0
Fair(2)	13	16	0	19	0	0
Average (3)	27	26	0	27	1	1
Good (4)	22	27	2	19	4	1
Excellent (5)	5	28	0	10	1	0
Total (n)	77	105	2	85	6	2
Mean	2.99	3.46	4	3	4	3.5

Table 3. Student Teaching and Internship Advising Rating by First Major Department

	AERS	AE4HYD	ASM	AVS	MMBB	PSES
Poor	10	5	0	9	0	0
Fair	6	11	0	18	1	0
Average	27	13	2	33	2	0
Good	25	36	0	18	2	1
Excellent	9	41	0	15	1	1
Total	77	106	2	93	6	2

of faculty serving as student academic advisors might provide additional satisfaction of students in regard to academic advising, and the addition of staff whose sole responsibility is student advising might also increase student advising satisfaction. The rating of above average for overall advising indicated that university advisors provided better overall career, internship and academic advising combined than they provided academic advising alone.

CALS graduates found their academic advisors to be available, knowledgeable, straightforward, reliable, professional, approachable, organized and concerned. Graduates most strongly agreed that their academic advisors were friendly, professional and available. The college should consider providing training for academic advisors to increase their knowledge of university, graduation, internship and certification requirements. A better informed advisor might be able to increase graduate perception of knowledge, reliability and organization in the academic advising arena and further the university strategic plan goals related to teaching and learning (CALS, 2013) as well as potentially increasing overall university, college and department retention rates. Future research should assess any changes over time as faculty, university and college goals and degree delivery methods (on-campus, off-campus, live, video conference, asynchronous) have changed.

The largest number of graduates who responded to this study initially majored in the Department of Agricultural Education and 4-H Youth Development, and AE4HYD was the second smallest department in the college. The smallest number of respondents was from the Plant, Soil and Entomological Sciences Department, the second largest department in the college. These response rates should be investigated. Valid emails were provided from the University of Idaho Alumni and Registrar's officers for a small number of the total graduates over the 20 year time span. Internally, it is recommended that the alumni office or the departments within the college work to ascertain current contact information for alumni which could be used by the university, alumni office, college and department for recruitment of potential students, solicitation of sponsorship for scholarships and university publicity. It is also recommended that a follow up study be conducted on a more regular basis to provide the most consistent and current graduate information to department and advisors. Externally, it is recommended to conduct similar research at peer institutions and within other colleges of study within the University of Idaho to provide an expanded base of comparison for departments, colleges and institutions.

Identifying strengths and weaknesses within academic and career advising within the College of Agricultural and Life Sciences would provide areas of professional development for preparing new faculty to serve as academic advisors within the college. Additionally, providing quality advising to students assists in educational satisfaction of graduates. Alumni who are satisfied with their college experience tend to provide influence to potential students to attend their alma mater. Finally, the long term impact of well-prepared academic advisors could help to increase recruitment and financial support to the University of Idaho, the College of Agricultural and Life Sciences and individual departments.

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Compact Power Equipment Troubleshooting Training: Formative Assessment using Think-Aloud Pair Problem Solving

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Abstract

Think-aloud pair problem solving (TAPPS) was used to formatively assess agriculture students' problem solving during compact power equipment troubleshooting training. A total of 56 students were taught engine operational theory and a troubleshooting procedure followed by training in TAPPS. Sixty-six percent of students were successful at identifying and repairing the fault. The chi-square test of association showed no significant difference (χ^2 (1) = 0.08, p = 0.78, phi = 0.038) in success rate between students who worked alone and those who used TAPPS. A review of video recordings of TAPPS sessions revealed unsuccessful students were unfamiliar with valve clearance adjustment procedures, forgot possible faults and unable to interpret cylinder leak down test results. Unsuccessful students struggled to connect engine theory of operation to troubleshooting procedure. TAPPS served as a way for the instructor to identify student misunderstandings to inform individual instructional interventions to improve students troubleshooting skills. Suggestions for instruction included memory association exercises to help students linking engine components with possible faults.

Introduction

Over the last decade, educational psychology research has gone to great lengths in attempting to determine how educators can improve students' problem solving skills specifically in the content areas of mathematics and physics (National Research Council, 2000; Renkl and Atkinson, 2003). P-12 STEM education initiatives and the ever-increasing complexity of technology have generated a great need for educators to examine the methods used for teaching students technical problem solving (Brophy et al., 2008). Tier IV emission regulations have been met with aggressive engineering solutions that integrate complex controller networks as well as equipment, thereby creating greater challenges in technician training for diagnosing performance issues and making troubleshooting

education an essential part of agricultural systems technology undergraduate programming. Research studies have shown mixed results regarding the success that think-aloud pair problem solving (TAPPS) may offer instructors at improving students troubleshooting. Pate and Miller (2011) found no significant difference between secondary students who used TAPPS and those who did not on troubleshooting success rate. Pate et al., (2004) found that using TAPPS during troubleshooting significantly improved post-secondary students' success rate at identifying and repairing an engine fault. With greater emphasis being placed on troubleshooting skills as an essential part of agricultural systems technology programming, the TAPPS strategy was selected for this study to determine if implementation would serve as a useful strategy for instructors seeking to improve students' technical problem solving skills.

The theoretical framework that guided this study was the cognitive information processing learning theory (CIPLT). This theory contends that learning and behavior develop through a person's interaction with the environment, previous experiences and current knowledge (Andre and Phye, 1986). From a cognitive information processing perspective, learning is viewed as a series of active, constructive and goal-oriented mental processes that rely heavily on the presence of metacognition (Shuell, 1986). Individuals have the ability to adapt to novel problem situations, such as troubleshooting, through information processing (Phye, 2005). For example when agricultural technicians are required to troubleshoot engine faults, they must process information gathered from the engine as well as from previous experiences and knowledge that is relevant to the problem situation in order to develop a solution.

In troubleshooting, students may have the technical knowledge but may lack the cognitive skill set necessary to access their knowledge under new and challenging conditions (Bandura, 1993). Research has shown (Schraw, 1998) that metacognitive instructional strategies,

such as TAPPS, can assist students with the organization and regulation of their information processing to improve their problem solving performance. The TAPPS strategy involves an individual person solving a problem while a listener asks questions to prompt the problem solver to verbalize their thoughts and clarify their thinking (Whimbey and Lochhead, 1986). The focus is on having students express their thoughts aloud while engaging in problem-solving activities, allowing them to become more aware of their thinking processes or access knowledge from long-term memory.

TAPPS could assist agricultural systems technology troubleshooting instruction in two ways. First, the amount and quality of a problem solver's technical knowledge has been shown to limit students' abilities to reach solutions (Davidson et al, 1994). TAPPS may afford instructors the opportunity to identify areas for supplemental instruction such as correction of misconceptions regarding engine operation theory or faulty problem search strategies. Instructors engaging in this strategy could provide immediate feedback to students to improve their performance. However, having students think aloud may impede their problem solving. Ericsson and Simon (1993) pointed out that the act of verbalizing thoughts can interfere with the execution of a problem solving task. Requiring students to talk aloud may slow their progress due to the difficulty they may face by putting more focus on communicating their thoughts into words. Students' motivation to talk aloud or comfort level with discussing their thoughts with others may inhibit or slow their success rate (Kluwe, 1982). Yet additional research (Berardi-Coletta et al., 1995) has documented that students' performance improved when they were asked to give reasons for their actions during problem solving. Second, Wood and Bandura (1989) identified that students with higher perceptions of their abilities persisted through problems of increasing difficulty and used analytic strategies in more efficient ways. If students verbalize the belief they are poor problem solvers, they may make fewer attempts to examine their thinking which may lower the number of solutions examined (Hacker, 1998). TAPPS may allow instructors the opportunity to identify those students and provide a means of intervention such as scaffolding troubleshooting exercises based on level of difficulty to increase students' troubleshooting self-efficacy.

The purpose of this exploratory study was to determine the effectiveness of TAPPS as a formative assessment for improving agricultural systems technology students' problem solving during compact power equipment troubleshooting training.

Objectives
- Describe agricultural systems technology students' thoughts while using TAPPS to troubleshoot a small gas engine compression fault.
- Identify areas to improve instruction through assessment of students' statements during troubleshooting.

Hypothesis
- There will be no significant differences in success rate and completion time for troubleshooting a small engine compression system fault between students who use TAPPS and students who do not use TAPPS.
- There will be no significant difference for engine knowledge test scores between students who are successful and students who are not successful at troubleshooting.

Methodology
Participants
This project was approved through Utah State University's IRB under protocol #2834. Between the 2011 and 2012 spring semesters, 56 students participated in a postsecondary compact power equipment class at Utah State University. The majority of students were male (80.4%, f = 45). Most students (58.9%, f = 33) were attending their third or fourth year of school. These students were assigned randomly to either the experimental or control group for the troubleshooting exercise. There were 28 students assigned to the control group and 28 assigned to the experimental group.

Research Design
This study used a randomized posttest-only control group experimental design (Campbell and Stanley, 1968). The strengths of this design include high internal validity and fewer assumptions are made regarding external influences because randomization essentially produces equivalent treatment and control groups. A potential limitation of this design may include lack of generalizability and possible contamination of the control group however the study was conducted in an actual classroom environment and multiple measures were taken to ensure the experimental protocol was followed. Students were assigned randomly to two groups. The single difference between groups was the use of TAPPS during troubleshooting. All 56 students were video recorded. A wireless lapel microphone was used to capture students' verbalizations as they were video recorded. Individuals were video recorded to ensure the fidelity of the treatments and document students problem solving process. All students were asked to troubleshoot identical Briggs and Stratton single cylinder air-cooled horizontal shaft overhead valve engines. Students were asked to individually troubleshoot their engine's fault. As a deception technique to discourage students from discussing the activity, students were told that each engine had a different fault and not to discuss their troubleshooting exercise until all students had completed the activity.

Students were isolated away from other students in an area using panels to surround them so they could not be observed or heard by other students during the troubleshooting exercise and were not disturbed by outside distractions. There was no evidence that

students violated protocol. Three engine faults were randomly assigned to students. The three engine faults were insufficient clearance between the rocker arm and the valve stem, a grounded ignition component or insufficient fuel delivery. Students assigned to the control group were recorded and were not asked to think aloud while troubleshooting but told they could talk to themselves if they wished. The experimental group used the TAPPS technique while troubleshooting. The undergraduate researcher acted as a participant observer and served as the listener partner for students assigned to TAPPS. The undergraduate researcher observed each individual student to ensure students followed protocol. The undergraduate researcher used a list of preapproved questions to prompt the TAPPS students to constantly verbalize their thoughts and clarify their thinking. Questions regarding their thinking included "What are you thinking now," "Tell me what you are thinking now," and "Tell me why you did that." The TAPPS students were required to orally verbalize their thoughts throughout the troubleshooting exercise.

Procedure

Students were randomly assigned to a treatment group at the beginning of the course. During the beginning weeks of the course students received instruction on basic engine operation theory. Prior to midterm, a standardize industry service exam developed by Briggs and Stratton Corporation was given to determine students' knowledge level regarding engine operation theory. It was assumed that the service exam for technician certification was content and face valid because it is utilized extensively by Briggs and Stratton Corporation to certify the proficiency of company master technicians. The test consisted of 50 questions, including multiple choice, multiple response and true/false items. Questions covered theory and general knowledge regarding compression, electrical theory, four cycle theory, fuel-carburetor and governors. Briggs and Stratton Corporation considers a score of 75% or greater to be passing.

Following the engine knowledge test, the research mentor provided each student with identical instruction regarding domain-specific knowledge on troubleshooting small gas engines via protocol adapted from Webster (2001). Students were presented technical information on the three major systems required for an engine to operate: compression, ignition and air/fuel intake. Following the troubleshooting instruction, the research mentor taught all students how to use TAPPS. Instruction regarding TAPPS included problems modified from Whimbey and Lochhead (1986) to provide practice for students with talking aloud during problem solving. Ericsson and Simon (1993) recommend this as a practice procedure to allow students to become comfortable with expressing their thoughts verbally. After instruction on troubleshooting and TAPPS, students individually went to the lab area to troubleshoot their engine problem. No hints were given regarding the engine fault. Students were instructed not to remove the cylinder head or crankcase cover.

Treatments

Each troubleshooter was given a 45-minute period in which to troubleshoot the engine fault and provided a complete set of basic engine repair tools which included: a compression gage, a cylinder leak down tester, a socket set, an engine repair manual, an ignition tester, torx bits, a set of metric and standard fractional combination end wrenches, screwdrivers and a supply of compressed air. During troubleshooting, students were asked to identify the correct fault, identify the engine system affected and correctly repair the fault. The undergraduate researcher was the listening partner for all of the TAPPS students and prompted each student to talk aloud as they were troubleshooting. If students paused for more than 10 seconds the undergraduate researcher asked them questions to probe their thinking. The undergraduate researcher did not ask questions regarding the engine or its possible faults. Students were instructed not to talk with each other regarding the exercise until the end of the data collection.

Troubleshooting solutions were checked to determine successfulness. A task outcome (successful or unsuccessful) was recorded for each student based on whether they were able to identify the correct fault, the engine system affected and correctly repair it in order for the engine to start and operate. Results were recorded for successfulness and time of completion for each student. The chi-square test of association was used to test for differences between the two groups in the nominal dependent variable, task completion for the problem (successful or unsuccessful). An independent t test was used to determine if there were significant differences in completion time between successful students in the experimental and control groups. An alpha level of 0.05 was set *a priori*.

In order to describe students' thought processes during troubleshooting, students recorded verbalizations were transcribed and coded. Two additional undergraduate researchers were recruited to assist with transcript analysis. The undergraduate researchers independently transcribed the recordings of the TAPPS students and then compared transcriptions to the recordings to identify any errors in the transcripts. Transcriptions were compared using Microsoft Word Track Change's Compare feature to validate credibility of the transcripts as stated by Ericsson and Simon (1993). The researcher mentor instructed the research assistants on how to code students' troubleshooting transcripts. For the analysis of the transcriptions, coding categories of students' verbalizations were classified into statements regarding troubleshooting instruction, engine theory or metacognition. Verbalizations were considered focused on the troubleshooting instruction if students' verbalized concerns with order of operations for identifying engine problems. Statements focusing on principles of engine theory such as the operations of the four-stroke cycle and engine components were considered engine theory statements. For metacognitive statements, Ericsson and Simon's (1993) protocol coding of verbalizations

was used. To be considered metacognitive, students' statements needed to involve planning, monitoring and evaluating to progress. Students' statements directed at judging themselves as performing poorly or well were identified as either negative self-assessment or positive self-assessment. Students' statements directed at judging the troubleshooting activity positively or negatively were coded as positive problem assessment or negative problem assessment. Students' verbalizations consisting of information irrelevant to solving the problem were coded as not on task.

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 (see Table 1). There was no significant difference between the TAPPS group and the control group on the engine knowledge test (t (54) =0.332, p =0.741). The mean for students using TAPPS was 51.3 (SD = 11.05) and the mean for students working alone was 50.4 (SD = 7.02).

Hypothesis 1: There will be no significant differences in success rate and completion time for troubleshooting a small engine compression system fault between students who use TAPPS and students who do not use TAPPS.

A total of 28 students completed the troubleshooting exercise alone. A total of 28 students completed the troubleshooting exercise using TAPPS. The number of successful students in the control group was 19. There were 18 successful students using TAPPS. Chi-square test of association showed no significant difference in success rate between students who worked alone and those who used TAPPS. The mean time to completion was 30.8 minutes (SD = 11.32) for students who worked alone. The mean time to completion was 30.6 minutes (SD = 9.44) for TAPPS. For students who were successful, there was no significant difference between the TAPPS group and the control group on time to completion (t (17) = 0.051, p = 0.960). Hypothesis 1 was retained.

Hypothesis 2: There will be no significant difference in engine knowledge test scores between students who are successful and students who are not successful at troubleshooting.

There were 37 successful students who completed the troubleshooting task. There were a total of 19 unsuccessful students participating in the troubleshooting task (see Table 2). There was a significant difference between the students who successfully completed the troubleshooting task and the unsuccessful students on the engine knowledge test (t (26)= 2.187 , p =0.038, d = 0.85). The mean percentage scored on the engine knowledge test for all successful students (n= 19) was 50.31 (SD = 8.52). The mean percentage scored on the engine knowledge test for unsuccessful students (n = 9) was 43.11 (SD = 7.21). The calculated Cohen's d (0.68) indicated a medium to large treatment effect (Cohen, 1992). Therefore, hypothesis 2 was rejected.

Differences in Verbalizations between Unsuccessful and Successful Students

All students began the troubleshooting exercise by checking engine fuel and oil levels and attempting to start the engine. Most successful students' verbalizations indicated a strict adherence to the troubleshooting protocol that was provided. Students worked using a systems approach checking through compression, ignition and air/fuel delivery as described in the instruction provided to them. Unsuccessful students did not check each system in order as presented in the troubleshooting protocol or indicated forgetting the troubleshooting procedure.

After attempting to start the engine, students began evaluating possible faults based on sensory data and then began planning test procedures for possible solutions. An example comment was, "When I pulled on the rewind starter, I didn't feel any resistance. It might be something wrong with the compression." One student stated "it sounds like it isn't getting fuel. That could mean something is wrong with the carburetor."

Comments classified for engine theory were directed at identification of engine components. Statements focused on pointing out engine components. Successful students' statements indicated a working knowledge of the function of primary systems such as timing of valves, air leaks, cylinder pressure/leakage and valve clearance. Additional comments were related to the ignition system and component functions. The component unsuccessful students most commonly focused on was the spark plug. These students rarely ventured into discussing other potential faults of the ignition system. Unsuccessful students had difficulty remembering how to use diagnostic tools properly.

Unsuccessful students often self-identified topics they needed to review to improve performance. Unsuccessful students discussed being unfamiliar with valve clearance adjustment procedures and indicated not knowing how to use the

Table 1. Student Performance by Group						
Group	Engine Knowledge Test [z]	Task outcome [y]				Minutes to completion [x]
	M (SD)	Successful		Unsuccessful		M (SD)
		n	%	n	%	n	M (SD)
Control (n = 28)	50.42 (SD = 7.02)	19	67.9	9	32.1	19	28.46 (10.5)
TAPPS (n = 28)	51.25 (SD =11.05)	18	64.3	10	35.7	18	28.90 (11.5)

[z] (t (54) =.332, p =0.741)
[y] ÷² (1) = .08, p = .78, φ = .038
[x] Data includes only students with a successful task outcome; (t (35) = .122, p = .904)

Table 2. Student Differences on Engine Knowledge Test by Troubleshooting Outcome		
Troubleshooting Outcome	Engine Knowledge Test	
	M [z]	SD
Successful (n =37)	52.8	9.5
Unsuccessful (n =19)	47.1	7.3

[z] t (54) = 2.296, p = .026, d = 0.68, test scores were given in percentage of correct answers.

compression leak down tester. A student mentioned "I wish I would have been here more when he was doing in the lab." Another student commented "I don't remember them [possible faults]. We covered it in class didn't we?" Two students made several negative self-assessment statements regarding their ability and level of content knowledge. Unsuccessful students' comments that indicated this were "I have no clue what I'm doing, I'm not good at this stuff" or "I don't even know where to start."

Conclusion, Implication and Recommendations

TAPPS served as a way for the research mentor to identify misunderstandings affecting students' troubleshooting skills. Unsuccessful students were unfamiliar with valve clearance adjustment procedures, forgot possible faults and unable to interpret cylinder leak down test results. Successful students using TAPPS were concentrated on planning test procedures and evaluating sensory data gathered from the engine. Suggestions for instruction included memory association exercises to help students linking engine components with possible faults.

There were 37 students who successfully completed the troubleshooting exercise. Yet, there was no significant difference between those students using TAPPS and those working alone. A significant difference was found in this study between students who successfully completed the troubleshooting task and those who did not on the engine knowledge test score. Students successfully troubleshooting the engine on average scored 5% higher than students who were not successful troubleshooting the engine. Analysis of student comments during troubleshooting with the research mentor identified engine operation theory and proper tool usage topics to review with unsuccessful students.

It is possible the high success rate that students experienced in this study may have been linked to the amount of instruction they received in how to use TAPPS. All students in this study received one class period of troubleshooting instruction and one class session how to use TAPPS for troubleshooting. Additionally, it is unknown if the higher success rate was linked to student self-efficacy. Students may have had a higher motivation to study and believed in their ability to complete the troubleshooting activity. This could have resulted in students increasing their study hours on troubleshooting and engine operation.

Instructors may benefit from using TAPPS to facilitate collaborative learning or as a formative assessment to identify student misunderstandings that could be used to inform decisions regarding instructional remediation. It is recommended that instructors utilize think-aloud sessions to determine quantity and quality of a problem solver's domain-specific knowledge. Suggestions for instructors of agriculture to incorporate this problem solving technique include livestock manure management planning, ventilation design for confined livestock operations and agribusiness planning. Future research should investigate the impact of using TAPPS to assess students' troubleshooting of equipment controller networks and automation programs. An implication for workforce employers could be that having technicians who are proficient in communicating their diagnostic procedures may reduce expenditures of company resources allocated to troubleshooting work orders such as technical maintenance and repairs.

Limitations

Caution should be exercised when generalizing the results of this study to populations outside of the participants from this exploratory study. A limitation of this study was the limited number of participating students. It is recommended that this study be replicated to ensure reliability of the results with a large sample. There was no difference between troubleshooting methods on improving students' troubleshooting success. There were no significant differences in average completion time for the students who used TAPPS compared to students in the control group. The chi-squared test of association showed no significant difference between the groups, therefore we concluded that for students involved in this study there was no difference in troubleshooting success rates between students who used TAPPS and students who worked alone. This study utilized a clinical approach to allow one-on-one interaction between the researcher and student. This procedure increased the control over diffusion of information between students. However, it could have been possible for students to talk outside of class. Informal interactions with students did not indicate that this occurred.

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An Assessment of Visual Communications Pilot Curriculum in Arkansas Secondary Agricultural Science Programs

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Abstract

Visual communications curriculum was developed and piloted in Arkansas secondary agricultural science courses. Perceptions of the curriculum and an associated experiential learning activity were assessed. Teachers were provided electronic access to all lessons, instructional PowerPoints, worksheets and handouts. Lessons in the curriculum covered basic photography, writing and videography competencies and skills. Upon completion of instruction, the University of Arkansas visited identified schools with a mobile classroom equipped with computers, digital SLR cameras and video cameras. Students spent a full day collaboratively taking photos and capturing video, which supported their agricultural news or feature storyboards for video development. Student (N = 72) perceptions were assessed using a 20 question instrument. Teacher (N = 7) participates were also surveyed. At the time of publication, eight Arkansas high school agricultural programs had completed the program, with one school repeating participation with a different group of students. Students noted the curriculum was enjoyable, interesting and practical for their future. Overall, teachers agreed that students gained knowledge about visual communications and were engaged and interested in the topic. Also, 87.5% of the teachers noted they would include the curriculum without the experiential (mobile classroom) portion of the program.

Introduction

Technology use and integration is growing rapidly in today's society. Technology can also aid in advancements in many everyday tasks, including education. Additionally, as the general public becomes further removed from the farm, communication becomes ever-critical to the promotion of agriculture (Bailey-Evans, 1994). By the 1900s, agricultural communications had evolved into a highly competitive industry requiring knowledge of business practices and editorial skills as well as farming (Burnett and Tucker, 2001). Agricultural communicators now use digital technologies to disseminate messages throughout media outlets and both secondary and postsecondary courses have shifted to reflect this change (Edgar et al., 2012).

"*Visual images are very powerful in their occupation of the publics' time and the shaping of how we process our surrounding environments*" (Sadler-Trainor, 2005, p. 9). Visual images play an important role in society due to the messages images portray, both positive and negative, regarding social class and culture (Edgar and Rutherford, 2012; Rhoades and Irani, 2008;). Secondary students have an inclination to learn digitally; therefore visual communications is an important area to study (Van Scoter, 2004). Consequently, many of the competencies outlined in the agricultural communications career development event (CDE) focus on visual communications. Thousands of secondary students compete in CDEs annually, nationally.

Agricultural education courses are built on a foundation of constructivism and experiential learning, which fosters and enhances understanding and knowledge about agriculture (Newcomb et al., 2004). Many secondary courses today integrate technology use to enhance student readiness of postsecondary education or the workforce (Mazurkewicz et al., 2012). In 2011, Hess and Trexler noted that "constructivist-based approaches for teaching agricultur[e] require experiential learning elements" (p. 159) in order to expand student learning and competencies in agricultural literacy. Agriculture continues to diversify and change, aiming to meet the needs of producer and commodity groups. This change and diversification has brought about the need to more effectively communicate and promote agriculture to an audience who is often uneducated about agriculture and its practices. "*As agricultural education enters the twenty first century, it [education and agriculture] must change with emerging trends in society and the agricultural industry*" (Talbert et al., 2005, p. 61). Currently, there is no curriculum area or educational frameworks outlined for agricultural communications to be taught in Arkansas

secondary agricultural science courses, making it difficult to provide career relevant experiences for students.

Today, agricultural education provides training for all students, including those who will not be involved with farming or entering the agricultural industry (Talbert et al., 2005). With change and agricultural diversification ever-present, agricultural education teachers, specifically those in secondary education, struggle to keep abreast of changes with emerging trends in society and the agricultural industry. However, agricultural education teachers are critical links between secondary students and agriculture. Additionally, a student's desire to achieve higher levels of learning stems from students' perceptions of great teaching (Wilson et al., 2010). "A teacher who achieves high levels of learning is no doubt a great teacher, but we assert that instructors should go one step further and also seek the label of greatness from the students" (Wilson et al, 2010, p. 64). It is important that new curriculum initiatives integrate innovative, excellent teachers to ensure diffusion of the content (Rogers, 2003).

Theoretical Framework

The Vocational Education Act of 1963 defined vocational education as courses used for the preparation of students for paid or unpaid employment (Hayward, 1993). Additionally, this act recognizes agricultural education courses as preparing individuals for college studies (Newcomb et al., 2004). This preparation for the workforce can be achieved through modified teaching methods that include reflective learning and hands-on engagement (Kolb, 1984; Leggette et al., 2012; Mazurkewicz et al., 2012; Palfrey and Gasser, 2008).

Constructivism has been used to represent a collection of theories, including generative learning (Wittrock, 1990), discovery learning (Bruner, 1961) and situated learning (Brown et al., 1991). Learning is an active process where the learner uses sensory input and construct meaning with the content based on previous learning and experiences (Mazurkewicz et al., 2012). Kolb (1984) proposed the theory of experiential learning that involved four principal stages: concrete experiences, reflective observation, abstract conceptualization and active experimentation. These teaching methods allow students to reach application, analysis, synthesis and evaluation, the higher tiers in Bloom's Taxonomy of learning (Bloom and Krathwohl, 1956). "Learners are expected to understand the applications they are learning" (Edgar, 2012, p. 5) and should be able to do more than simply act on memorization.

"*Communications in agriculture are designed to introduce students to topics related to promoting agriculture through a variety of media sources*" (Oklahoma Instructional Media Center, 2010, p. 5). However, since the incorporation of the agricultural communications CDE and the development of *The Guidebook for Agricultural Communications in the Classroom*, Arkansas has yet to develop an educational framework in agricultural

communications to teach secondary students about technologies and careers associated with the field. Yet, recent research priority areas in the field note the importance of visual communications curriculum and training in secondary education programs, including: (a) sufficient scientific and professional workforce that addresses the challenges of the 21st century; (b) meaningful, engaged learning in all environments; and (c) efficient and effective agricultural education programs (Doerfert, 2011).

The diffusion of innovations can be, and usually is, a long intricate process. Rogers (2003) developed a widely used model for following a new product through the diffusion process. Rogers (2003) defined diffusion as "*the process in which an innovation is communicated through certain channels over time among the members of a social system*" (p. 5). There is a need for agricultural communications curriculum to be incorporated in Arkansas secondary agricultural education programs to help meet the needs of the industry. As new curriculum is developed, it must go through the same processes new technology and other innovations go through to be accepted by teachers. "*The early adopter is respected by his or her peers and is the embodiment of successful, discrete use of new ideas*" (Rogers, 2003, p. 283). This study targeted Arkansas secondary agricultural science teachers who were identified as early adopters.

As agricultural communications becomes a more prominent area of the industry, it is important for secondary agricultural education programs to build student interest in this area (Fraze et al., 2013). Prior to this study, University of Arkansas faculty secured funding to develop agricultural (visual) communications curriculum and activities. The curriculum was used to prepare students to create promotional videos about agriculture. Upon completion of the developed program (curriculum and a mobile classroom project), Arkansas teachers and state educational staff were provided the opportunity to decide if the curriculum implementation into the educational frameworks for secondary agricultural courses would meet their needs. In order for the program to progress in the innovation decision process and for agricultural communications curriculum to be expanded, perceptions of the students and teachers who participated in the Visual Communications program must be assessed. The purpose of this study was to assess participants' (students' and teachers') perceptions of the Visual Communications program. The following research questions guided the study:

- How do students perceive the curriculum associated with the Visual Communications program?
- How do students perceive the hands-on, experiential video production activity (mobile classroom) associated with the program?
- How do teachers perceive the Visual Communications program (curriculum and mobile classroom experience)?

Materials and Methods

In the summer of 2010, the University of Arkansas developed *The Visual Communication on the Road in Arkansas: Video and Photo Creative Projects to Promote Agriculture* (Visual Communications) program. The program was based on a constructivist foundation and integrated the national FFA organizations model of classroom learning, laboratory activities and FFA involvement. The educational units of instruction also included areas of importance for agricultural communicators as outlined by Akers et al. (2001).

Interested teachers were provided access to the curriculum via the University of Arkansas Department of Agricultural Education, Communications and Technology's website (http://aeed.uark.edu/mobile_classroom.php). Participating teachers voluntarily elected to incorporate the program into a course they were already teaching. Students of that course were then selected as the students participating in this study, with parental consent. Curriculum covered photography, news and feature writing and videography and was made available electronically to Arkansas secondary agricultural programs. This pilot curriculum was taught by agricultural science teachers ($N = 7$) in eight classrooms prior to an experiential learning activity that took place in a mobile classroom. The Visual Communications program curriculum was designed with 10 lessons of classroom instruction/ activities that included teacher lesson plans, instructional PowerPoints, worksheets, handouts and assessments. After teachers finished delivering the curriculum units, students completed either a news- or feature-style storyboard focused on an agricultural related topic that would be used to create a video.

Once the University of Arkansas approved the student storyboards, they visited the school with a mobile classroom equipped with digital, single-lens reflex (SLR) and video cameras and laptops with photo and video editing software to assist secondary students with video creation and dissemination via YouTube. The mobile classroom (a 7x14' cargo trailer converted to a small classroom) was used to assist student groups (with three to five participants in each group) shoot photos and video and then create a three to five minute video promoting an agricultural topic or story. Each participating school created two to five student videos and completed videos were rendered and posted to YouTube. During this day, students also learned about agricultural communication careers available.

The fall 2010 semester was used as a pilot (testing) period for the curriculum and a daylong experiential experience to apply knowledge gained (using the mobile classroom) through application. During the pilot, four schools participated in the program. The pilot group was strategically targeted based on school location throughout Arkansas (n = 3 schools; n = 27 students) in the fall of 2010. In the spring of 2011, participating schools were selected based on teacher willingness to incorporate the curriculum into one of their agricultural science courses (n = 5 schools; n = 45 students). There were only minor wording changes made to curriculum and assessments after the pilot group and no significant difference was found between student data from the different semesters. Therefore, all data were compressed and reported together (N = 72 students).

Throughout the program students were asked to complete questionnaires after each specific curriculum unit was taught by the collaborating agricultural science teacher. Each questionnaire referenced the topic and assessed the students' knowledge of the specific visual communications area, how/if they enjoyed learning about it, its value to their education and if they found it to be practical. Perception questions were adapted from an instrument by Silance and Remmers (1934) to fit the content of this study. The instrument contained 20 items on a seven-point Likert scale (1 = "strongly disagree" and 7 = "strongly agree") designed to determine respondent perceptions about the Visual Communications curriculum. To prevent response set, seven of these 20 items were negatively worded. Negatively worded questions were reverse coded for analysis. Students were also asked to complete an instrument regarding the mobile classroom experience. The researchers followed Dillman's (2007) Tailored Design method to reduce instrumentation bias in question wording. Cronbach's Alpha was used to test instrument (curriculum and mobile classroom) reliability. Instrument reliability ranged from Cronbach's Alpha of 0.75 to 0.88 for both student perception based instruments.

Teachers who taught the curriculum were surveyed after completion of the program. Agricultural science teachers assessed the curriculum units and the hands-on (mobile classroom) portion of the program via Survey Monkey; an electronic survey instrument. Arkansas agricultural science teachers (N = 7) participating in the Visual Communications program were assessed to determine their perceptions of the program. Upon completion of the program, project administrators sent an email to the teachers with the link to the instrument. Teacher perceptions of the usefulness of the provided instructional materials for the curriculum as well as student understanding of visual communications post-curriculum were assessed using a five-point Likert scale (1 = "strongly disagree" to 5= "strongly agree"). Teachers were also asked if they perceived the students to be interested in the curriculum, if the curriculum was useful for the students' future and if they believed their students were engaged throughout the project based on a four-point Likert scale (1 = "not at all" to 4 = "very"). Instrumentation development followed Dillman's (2007) Tailored Design method to increase participation and reduce instrumentation bias in question wording. Instrument reliability ranged from Cronbach's Alpha of .63 to .81. Data were analyzed using descriptive (means and standard deviations) analysis.

Results and Findings

Students in this study were assessed during the fall 2010 and spring 2011 semesters and are presented together. Participating schools represented four regions of Arkansas. Twenty-six female students and 46 male students (N = 72) participated in the Visual Communications program and had useable/completed responses for the perceptions-based instrument. All student instruments were completed via paper and pen. Student perception data were coded and input by the researchers. Because frameworks outlining agricultural communications curriculum in Arkansas do not exist, teachers choose, at their own discretion, a class to participate. Students in the sample were mixed classes of freshman to seniors in high school and classes varied in subject area.

Student Perception Curriculum Developed for the Visual Communications Program

For the curriculum unit, students were agreeable in each category (interest, enjoyment and practicality) but not highly agreeable in any specific area (photography, writing and videography). Students indicated that they "moderately agreed" to "agreed" that the visual communications curriculum was enjoyable (M = 5.56, SD = 0.80), practical (M = 5.52, SD = 1.03) and interesting (M = 5.51, SD = 0.93). Table 1 notes students' perceptions in each area for each school. School G rated all three areas of assessment regarding the agricultural communications curriculum between "indifferent"

(neither agreed nor disagreed) and "moderately agree", while all other schools "agreed" to "strongly agreed" with the enjoyment, practicality and interest statements, regarding the curriculum.

Student Perception of the Video Production Activity

Overall, students noted they "agree" with statements regarding the mobile classroom project in all assessment categories (enjoyment, practicality and interest). Using a seven-point scale (7 being strongly agree), students "moderately agreed" to "agreed" that the mobile classroom activity (video production project) was enjoyable (M = 5.69, SD = 0.85), interesting (M = 5.83, SD = 0.96) and practical (M = 5.70, SD = 1.02). Table 2 displays students' perceptions of the mobile classroom (experiential learning activity) by school. School D (located in the north central part of Arkansas) rated the mobile classroom highest with a mean greater than six in each category, noting that they "agreed" with each enjoyment, practicality and interest statement regarding the mobile classroom experience.

Teacher Perception of Visual Communications Program

Agricultural science teachers were given an instrument using Likert-type scales (4- and 5-point) to determine their perceptions of the Visual Communications program and the mobile classroom experience. Arkansas agricultural science teachers in this sample population (N

Table 1. Student Perceptions of the Agricultural Communications Curriculum (N = 72)				
Assessment Area	Secondary School	n	M	SD
Enjoyment				
	A	10	5.83	0.81
	B	6	5.47	0.53
	C	11	5.56	0.89
	D	12	5.88	0.42
	E	9	5.76	0.85
	F	8	5.31	0.84
	G	11	4.82	0.68
	H	5	6.00	0.91
	Overall	72	5.56	0.80
Practicality				
	A	10	5.63	1.13
	B	6	5.52	0.87
	C	11	5.54	1.23
	D	12	6.12	0.41
	E	9	5.46	1.31
	F	8	5.41	0.57
	G	11	4.58	1.01
	H	5	6.14	0.52
	Overall	72	5.52	1.03
Interest				
	A	10	5.61	1.09
	B	6	5.21	0.56
	C	11	5.39	0.98
	D	12	6.17	0.44
	E	9	5.41	1.31
	F	8	5.46	0.59
	G	11	4.95	1.00
	H	5	5.86	0.83
	Overall	72	5.51	0.95

*Note. Scale of items: 1 = strongly disagree, 2 = moderately disagree, 3 = disagree, 4 = neither disagree nor agree, 5 = moderately agree, 6 = agree, 7 = strongly agree

Table 2. Student Perceptions for the Mobile Classroom Visit (N = 72)				
Assessment Area	School	n	M	SD
Enjoyment				
	A	10	5.83	0.81
	B	6	5.47	0.53
	C	11	5.56	0.89
	D	12	6.04	0.54
	E	9	5.80	1.11
	F	8	6.15	0.51
	G	11	5.41	0.65
	H	5	5.80	1.21
	Overall	72	5.69	0.85
Practicality				
	A	10	5.62	1.13
	B	6	5.52	0.88
	C	11	5.54	1.23
	D	12	6.02	0.43
	E	9	5.95	1.43
	F	8	5.96	0.64
	G	11	5.29	1.32
	H	5	5.23	1.50
	Overall	72	5.70	1.02
Interest				
	A	10	5.61	1.08
	B	6	5.21	0.56
	C	11	5.39	0.98
	D	12	6.24	0.45
	E	9	5.65	1.43
	F	8	5.84	0.68
	G	11	6.64	1.29
	H	5	5.31	1.55
	Overall	72	5.83	0.96

*Note. Scale of items: 1 = strongly disagree, 2 = moderately disagree, 3 = disagree, 4 = neither disagree nor agree, 5 = moderately agree, 6 = agree, 7 = strongly agree

= 7) participated in the visual communications program assessment. Total years of teaching experience was analyzed and resulted in 28.6% with less than one year, 14.3% with one to three years, 14.3% with six to ten years and 42.9% with more than 10 years of teaching experience. Gender of the participating teachers was 71.4% male and 28.6% female. Teachers identified their ethnicities as either white (85.7%) or other (14.3%). Level of respondents' education was identified into two levels with either a bachelor's degree (42.9%) or a master's degree (57.1%) as the highest level of education completed. Grade level presently teaching was primarily 9th through 12th grade (71.4%) with 28.6% of participating teachers teaching 7th through 12th grade.

On average, curriculum instruction took teachers 13.6 days to complete. The curriculum was taught in a variety of secondary agricultural science classes, including: agriculture business, agriculture marketing, biological animal science, leadership and communications and agriculture science and technology. Participating teachers spent on average a total of six to 10 hours preparing to teach the agricultural communications curriculum. The majority of teachers (57.1%) noted they were involved during the mobile classroom visit. All teachers indicated that the curriculum could be taught in the same class again and agreed they would teach the curriculum again. The majority (85.7%) of the teachers noted that they would continue teaching curriculum without the Visual Communications program. Teachers noted that the majority of their students had access to digital equipment needed (digital cameras and video cameras) but few had access to software (Adobe Photoshop and Premier Pro).

Teachers were asked to assess the curriculum (lesson plans, PowerPoints, handouts, etc.) based on how the provided materials met their needs for instruction (based on a five-point Likert scale 1 = strongly disagree to 5 = strongly agree). The mean rating of the provided instructional material was "neutral" (M = 3.80, SD = 1.10). However, teachers "agreed" (M = 4.29, SD = 0.76) that students had a better understanding and general knowledge of visual communications after being taught the curriculum.

When asked to rate their level of agreement on a four-point Likert scale (1 = not at all agree, 2 = somewhat agree, 3 = mostly agree and 4 = fully agree) teachers "somewhat agreed" (M = 2.00, SD = 0.58) students were interested in the topics covered in the curriculum. Teachers felt the students would "most likely" (M = 3.00; SD = 0.82) be able to apply this information in their future (based on a four-point Likert scale with 1 = not applicable, 2 = somewhat likely, 3 = most likely and 4 = very likely). Agriculture teachers noted that students were "mostly" to "very" engaged and on task during the mobile classroom visit (M = 3.57, SD = 0.79).

Summary

Students consistently "moderately agreed" to "agreed" in the overall level of enjoyment, interest and practicality of the visual communications curriculum. Therefore, respondents perceived the curriculum to have value in their learning. Students' indicated the curriculum had practical application to their lives and they were interested in the topics. Therefore, students' collaboration (which is a method used through the curriculum's design) may have led them to have more positive perceptions; resulting in further understanding, which supports Edgar's (2012) work and constructivist approaches to learning (Hess and Trexler, 2011). It can be further postulated that positive perceptions of the visual (agricultural) communications curriculum may have occurred due to students' ability to apply new concepts and ideas (USC-CET, 2006) or engage in additional technology in the classroom (Bailey-Evans, 1994; Edgar et al., 2012).

Further it was found that participants perceived the mobile classroom (experiential) activity to be positive for enjoyment, practicality and interest. Combined with the curriculum presented, the mobile classroom activity may have elevated student perceptions through positive feelings elicited during experiential learning (Kolb, 1984). The Visual Communications program allowed students to make reflective observations and abstract conceptualizations (Kolb, 1984) taught in curriculum and applied during the mobile classroom experience. Students then applied concrete experiences along with active experimentation (Kolb, 1984) during the video production process, which may have positively impacted student perceptions.

Teachers were "neutral" on the usefulness of the prepared agricultural communications curriculum, which could be due to the pre-developed instructional material limiting their use of preferred teaching style or due to a lack of available technology at their school. Regardless of their neutral perception of the prepared curriculum, the majority of teachers noted they would continue using the instructional material even without visits from the mobile classroom.

Overall, teachers noted that curriculum improved students' understanding of visual communications and that students were interested in the topics covered. It can be concluded that the development and implementation of the program was perceived as "most likely" valuable to students' future by the instructors and that students were engaged throughout the experiential learning activity. Therefore, the research supports experiential learning activities can positively impact students at the secondary education level (Kolb, 1984). It should also be acknowledged that the impact of the program, at least through the lens of participants, was successful.

There are over 100 secondary agricultural science programs in the state, but due to end of course testing it was difficult for teachers to agree to participate in the piloted Visual Communications program. Teachers were generally concerned that the new content did not tie to curriculum frameworks which are tested through end of course examinations. Therefore, many instructors cannot afford to use valuable teaching time in order to

offer a program which is not directly linked to educational frameworks. Participating schools and instructors who agreed to participate were able to find avenues where the curriculum could be integrated into a class that was not being tested based on frameworks. Therefore, future efforts must be made to align curriculum with state educational frameworks. It is surmised that agricultural education programs outside of Arkansas could take the prescribed curriculum and also implement it into courses. The curriculum could also be used as training material for students participating in the agricultural communications CDE.

Through discussion of topics and competencies covered in this program, agricultural communications curriculum could be added to the agricultural education frameworks in Arkansas. It is unknown at this time if an entire course could be added or if curriculum will be added to an already existing course. Although opinion leaders (teachers) were targeted to teach the curriculum (Rogers, 2003). Future assessments should focus on the early adopters (teachers integrating the curriculum on their own) opinions, because their opinions will influence other teachers in the state regarding whether or not the Visual Communications curriculum adoption occurs.

Because agricultural communications is a relatively new conceptual area in secondary agricultural programs and has high levels of technology integration, established teachers may have a difficult time understanding the material. Therefore, state trainings should be initiated to assist teachers with increased comfort in teaching the curriculum and to enhance their knowledge and skills in visual and agricultural communications. Teachers should be provided with instruction on how to better incorporate visual communication technology into the classroom. Additionally, future research should focus on teachers' influence of students' perceptions regarding the curriculum due to teachers influence on student learning (Wilson et al, 2010).

The curriculum should be improved to strengthen both student and teachers perceptions of the engagement, practicality and interested of the instruction. Additional research should be conducted regarding agricultural communications knowledge, competencies, skillsets needed in industry before modifying and expanding this curriculum for incorporation into state educational frameworks. Students who participated in the Visual Communications program should be surveyed to determine if the knowledge and skills gained during the program influenced them to create videos on their own time or look further into careers related to agricultural communications.

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"A.S.P.I.R.E." ACT Supplemental Preparation in Rural Education: An Initiative Designed to Bridge Deficits on the ACT College Entrance Examination

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Abstract

High school students from rural agriculturally intensive communities that have been described as socioeconomically distressed frequently have an interest in pursuing higher education within agricultural fields of study to enhance their future careers. However, these students are often unsuccessful in gaining admissions to universities offering B.S. degrees in agricultural and life sciences due to significantly lower scores on college entrance examinations such as the ACT. The A.S.P.I.R.E. (ACT Supplemental Preparation In Rural Education) Program is an initiative that partners the College of Agriculture and Life Sciences at NC State University with the North Carolina Cooperative Extension System to bridge these apparent deficits in rural high school students' performance on the ACT College Entrance Examination in order to increase admissions rates of these students. Through participation in the A.S.P.I.R.E. course, students have been shown to increase their ACT score on average by approximately 3.5 points on the ACT's 36 point scale.

Introduction

Students' college entrance examination scores on the SAT and ACT are used for the standardization and comparison of students for admission which affects students' college admission statuses (Mattern et al., 2011). College admissions committees consider a number of factors when determining whether or not to admit a student, one of which is student performance on college entrance examinations (Lane et al., 2009). The ACT and SAT remain the normal referenced tests that are used by colleges and universities to compare college applicants against one another (Atkinson and Geiser, 2009). The use of standardized test scores as a screening instrument has intensified in recent decades in an effort to ease the evaluation burden associated with the growing number of highly qualified and diverse applicant pool (Alon, 2009). Now that universities rely so heavily on test scores, other admissions decisions, like class rank, have declined in importance (Alon, 2009). "This shifting meritocracy means rising returns to test scores in admission" and therefore "favoring seniors with high test scores" (Alon, 2009, p.736). This indicates that students could be denied admission to a university and subsequent pursuit of a higher education as a result of poor performance on a college entrance examination.

On college entrance examinations, "low scores very often disqualify students from admission." (Buchmann et al., 2012, p.438). With college entrance examination scores posing an enormous hurdle to college admissions, it is imperative that rural youth obtain the highest score possible on the examination in order to bridge the deficit on college entrance examinations. The A.S.P.I.R.E Program was designed as a partnership between North Carolina State University and the NC Cooperative Extension System to help students, in areas that are deemed as rural, ag-intensive, or have been classified by North Carolina as socioeconomically distressed. This program will help bridge deficits on students' scores for the ACT examination. Through this program, NC Cooperative Extension agents are able to follow their mission of offering "youth development opportunities throughout rural America" (Conglose, 2000) and providing educational assistance to "the rural, agrarian American population" (Cooper and Graham, 2001).

Program Overview and Implementation

The A.S.P.I.R.E. Program is a cooperative initiative between the College of Agriculture and Life Science at North Carolina State University and the NC Cooperative

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Extension system. It was devised as a means of improving rural high school students' ACT college entrance examination scores. By increasing ACT scores, the college admissions rates will improve for rural high school students from agriculturally intensive counties classified as socioeconomically distressed, who are interested in pursuing higher education and future careers within agricultural and life science disciplines. Socioeconomic status was determined by the North Carolina Department of Commerce's annual ranking of the state's counties based on economic well-being. Rural designation was determined by the US Census Bureau's urban-rural classification.

A.S.P.I.R.E. counties were selected based off of their socioeconomic status, rural classification and agricultural intensity. The A.S.P.I.R.E. agents (North Carolina Cooperative Extension Agents) from the aforementioned counties complete a 24 hour, intensive ACT Master Trainer Course offered by the standardized test preparatory company The Princeton Review Inc. A.S.P.I.R.E. agents are trained to teach ACT test preparation and then these agents teach the preparation course to high school students throughout rural, ag-intensive and socioeconomically distressed North Carolina counties. The target demographic for students participating in the A.S.P.I.R.E. program are high school sophomores and juniors with a minimum 3.2 grade point average and a demonstrated interest in agricultural and life science careers, who reside in a county with a trained A.S.P.I.R.E. agent.

As a part of their participation in the A.S.P.I.R.E. program, students receive a Princeton Review ACT Study Manual, Princeton Review 1,296 practice questions manual, on-line access to additional practice questions, four full-length diagnostic ACT practice exams with score analysis and breakdown, Princeton Review Selective College Admissions Booklet, 30 hours of class instruction for ACT test preparation and college application assistance. A.S.P.I.R.E. students learn the latest skills and strategies to help improve their ACT scores, therefore increasing their chances of gaining college admissions to agricultural and life science degree programs. These students are charged $50 for all of the materials they receive. Financial assistance is available for students who qualify for the Free or Reduced Lunch in the National School Lunch Program.

Ultimately the A.S.P.I.R.E. program's goal was to improve ACT scores of rural high school students in North Carolina from socioeconomically distressed counties; thus increasing the likelihood that these students' will gain acceptance to post-secondary agricultural and life science degree programs. This program will effectively provide a greater number of college-educated individuals with an interest in pursuing careers in agriculture or life sciences in years to come in this state, therefore helping to develop the future agricultural leaders within North Carolina.

Methods

Five counties participated in the pilot study for the A.S.P.I.R.E. program during summer and fall of 2012. These counties were selected based on agriculture intensity, socioeconomic level and rural classification. There were a total of eight NC Extension Agents from the pilot counties that completed the Princeton Review Master Trainer 24 hour course to learn how to provide ACT test preparation to high school students through the A.S.P.I.R.E. program. Participation was open to any student residing in a county with an A.S.P.I.R.E. agent. Fifty students (n=50) across these five counties completed the 10 weeks of ACT test preparation taught by the A.S.P.I.R.E. instructors. During the course, students received 30 hours of ACT test preparation in the following subjects: Reading, English, Math and Science. As part of the A.S.P.I.R.E. program, students took four full-length ACT practice exams. Scores were recorded from all students at each testing. The first test (pre-test) was administered prior to any ACT test preparation instruction. The second exam took place after 10 hours of instruction, the third test after 20 hours of ACT test preparation and a fourth (post-test) was given to participants after completion of the entire course. For each test, A.S.P.I.R.E. students are allotted four hours to complete the practice ACT test, which is administered on Saturday mornings to simulate real ACT testing. The A.S.P.I.R.E. participants answer the questions on a Scantron® answer sheet and the A.S.P.I.R.E. agents submit the Scantrons® to The Princeton Review Inc.. The tests are scored and returned to the A.S.P.I.R.E. agents for distribution to the participants. The scores from the four ACT exams were then analyzed using a Proc Mixed analysis (SAS, 2012). Means were separated using the Proc Mixed of the SAS program with a p-value <0.05 indicating significant differences between means.

Results

The ACT is scored on a 36 point scale composed of the average grade of four sections including: Math, Science, English and Reading. The A.S.P.I.R.E. pilot pre-test ACT scores averaged 18.8. The results revealed that reading was the least problematic area with scores of 20.4; and English was the lowest, scoring 17.6. (Table 1)

For each section of the test (Math, English, Reading and Science) scores improved overall. Specifically, for the math section, the average pre-test score was 18.6 and for the post test it was 21.6 indicating the average score improved by three points. A.S.P.I.R.E. participants

Table 1. Estimated means for A.S.P.I.R.E. test scores on Pre-test (test 1), test 2, test 3, and Post-test (test 4) on the 36 point ACT scale. (n=50)

	Pre-test (Test 1)	Test 2	Test 3	Post-test (Test 4)	SEM (Standard Error of the Mean)	P-value
Math	18.6[c]	18.7[c]	20.2[b]	21.6[a]	0.69	<.001
Science	18.7[c]	20.3[b]	17.9[c]	22[a]	0.76	<.001
English	17.6[c]	21.2[b]	20.4[b]	23[a]	0.93	<.001
Reading	20.4[c]	24.8[a]	21.7[bc]	22.6[b]	1.09	<0.01
ACT Composite	18.8[c]	21.3[ab]	20[bc]	22.3[a]	0.74	<.001

improved their scores in the Science section by 3.3 points with an average score of 18.7 on the pre-test and a 22 on the post test. English had the lowest average score on the pre-test, with an average score of 17.6, however, the average post-test score improvement for English was the highest with a score of 23 showing students improved an average of 5.4 points. The highest overall scores were associated with reading on the pre- and post- test with scores of 20.4 (pre-test) and 22.6 (post-test). A.S.P.I.R.E. classes improved test scores in all four areas and the composite ACT score was increased by 3.5 points (18% improvement); the average scores being, pre-test 18.8 and post-test 22.3 points. (Table 1)

Summary

Through the A.S.P.I.R.E. Program, the aim is to impact the lives of NC rural high school students from ag-intensive, socioeconomically distressed counties by improving their ACT college entrance examination score which will assist them in gaining acceptance to pursue a higher education in agricultural and life science degree programs. This quote "*Strong demand for more educated workers, coupled with a relative slowdown of their supply, has led to a sharp increase in the wage premium of college degrees in the United States since the 1980s*" by Roksa (2010, p. 389) rings true. For many rural high school students, college degree attainment will enhance their prospect for a successful future. A.S.P.I.R.E. participants improved their ACT composite score by 3.5 points on average (an 18% improvement from the beginning to the completion of the A.S.P.I.R.E. course); therefore, students have a greater probability of realizing those dreams. This data indicates that the A.S.P.I.R.E. program, offered through North Carolina State University and the North Carolina Cooperative Extension, is successful in improving socioeconomically distressed students residing in rural and agriculturally intensive counties average ACT score. With the programs continued use it will improve students' ACT scores and can enhance rural and socioeconomically distressed students' chances of gaining admissions into a four year university/college.

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Teaching Tips/Notes

Collaborative Book Reviews: Mentoring Students in Agroecology Courses.

Introduction

Critical reviewing skills used to assess the value of books and literature papers are essential for students in agroecology and other disciplines. One traditional way of building this skill is to assign books to be read and reviewed, with these assignments evaluated and graded as one part of course requirements. Some students today challenge us with the idea that, "If it is not on the web, it does not exist!" Many of us with an academic background grew up frequenting the library, with endless opportunities of browsing the stacks and uncovering numerous books that broadened our education and contributed perspective to a thesis or dissertation. We remain committed to enticing students to follow this path, as well as the more common 'surfing the web' to come up with information. Although the web exploration is analogous to browsing the library, and probably more efficient, we insist that the classical book review assignment is one incentive to get students into the library – on line or in the physical building.

In an agroecology class two books are recommended for students to review: *Silent Spring* (Carson, 1962) for the farming systems and environmental impact part of the class, and *Fast Food Nation* (Schlosser, 2001) for the food systems part of the class. These classic books continue to provoke useful discussion in a class inhabited by mostly majors in Agronomy & Horticulture and in Natural Resources. For those who have read these books for another class, and would find the exercise repetitive, I allow them to choose another book that is relevant to the theme and use this as a substitute. In Spring, 2013 I had a number of books awaiting review, and decided to share this opportunity with select students who were identified from previous written exercises as perceptive, diligent and appropriately critical of the written word. I offered these students the chance to review a book that I would also review, and suggested that we combine the two and submit a co-written review for publication. There were eight books reviewed, and the reviews submitted for consideration by journals; seven have been accepted for publication. A literature review of what is important in book reviews, the process we used in class, and the comments of student co-authors about the results are summarized.

Methods

There are numerous ideas in the literature about the importance of quality reviews and guidelines for how to conduct such an exercise. This is an important skill for students to practice, since they will be continuously evaluating published information for veracity and relevance. Particularly important is the skill developed by graduate students prior to doing comprehensive literature reviews for a thesis or dissertation project. If such skills can be developed in classes prior to thesis work, students will be much better prepared to be critical analysts of what they read.

According to the Indiana University writing center, an ideal book review will describe the content of a book, and then analyze how well the writing achieves the purposes stated by the author, and finally the personal reactions of the one doing the review (Writing Tutorial Services, 2004). In describing personal opinions one can include comparisons to other books on the topic, the logical organization of the book, and the credibility of the author. One humorous account describes 'how not to write a review', quoting two scathing reviews of Keat's poetry, and refers to Aristotle in making the same telling points listed above that focus on what the book is about, then how the author describes that content, and then what the reviewer thinks about the review (Pinsky, 2011). Northedge (2005) considers critical thinking one of the key skills for academic success, and one that should be applied in analyzing and evaluating whatever we read in science. Several questions that are raised include:

- Is the argument coherent and is the sequence of presentation logical?
- Are the conclusions clear and do they flow from the analysis presented?
- Are there indications of bias or use of emotional appeal in the language used?
- How do the conclusions agree with or differ from others in the same field?

For reading critically, the same author (Northedge, 2013) offers a series of logical steps in the evaluation of academic texts, whether these are journal articles or books:

- First identify the arguments, and the author's main line of reasoning.
- Then analyze and criticize the argument. Are reasons sufficient? Is it logical? Is the style objective?

- Also assess the evidence. What types are presented and are they valid?
- What are the conclusions and are they supported by the evidence?
- Are alternatives presented? How does this report agree or disagree with other reports?

Results

Several agroecology students read and reviewed contemporary books on farming and food systems, and wrote reviews to submit to fulfill their class requirement. When they returned the books, I did a similar task and then combined the two reviews. There was some exchange between instructor and student as we rationalized differences between our interpretations, especially on how well the authors had met their stated objectives for each book and our personal opinions about the content and approach. Seven of the reviews have already been published since they were submitted after the end of spring semester, for example Avery and Francis (2013), Stewart and Francis, (2013), Pirog and Francis (2013), Yerdon and Francis (2013), and Roché and Francis (2013).

During the review process, including responses to editors, proofing galleys and providing copyright forms, I kept the students involved in each step. They uniformly expressed amazement at the rigor and organization of the submission and review process, and especially at the time involved in moving a publication through the steps needed to reach print. The students were also unanimous in their excitement at being involved in publishing work from their class assignment, and felt this was a valuable dimension of education that would contribute directly to their professional futures.

Conclusions

From this experiment in one semester, I conclude that sharing responsibility with students for writing book reviews is a mutually rewarding experience. Students gain practical skills in reading, analyzing and writing a review that will communicate with potential readers the value of acquiring a book to expand their general knowledge or improve specific professional expertise. The value to an instructor is the opportunity to work with mentoring students in new ways. The level of responsibility is raised when the joint review is intended for publication in a credible national or international journal. Such a win-win situation is the type we should pursue in academia.

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Farm Safety Day Camp Programs for Youth

Introduction

According to the National Agriculture Statistic Service (NASS, 2009), there were 15,876 agriculture-related injuries, which occurred to children or adolescents under the age of 20 who lived on, worked on or visited a farm in 2009. Of all the children injured in farm related accidents, just over 48% of them lived in the Midwest. In Ohio alone, there were 35 farm-related fatalities involving children from 1993 to 2002 (The Ohio State University, 2002). Putnam County Ohio is the 5th largest agricultural county in the state of Ohio. A local Farm Safety Camp is designed to educate children about safe practices and to reduce their risk of injury when on farms. Raising awareness of the potential dangers existing in rural areas and on farms enables youth to be more knowledgeable and careful, around agricultural facilities, equipment, and even their own homes.

Procedures

Ohio State University Extension Putnam County Ohio partners with the Sheriff's Department and the

Teaching Tips/Notes

Health Department to plan the event. The safety camp is held at a local grain and livestock farm. The county's nine public schools and three parochial schools are contacted in the fall to hold an early April date for the Farm Safety Day Camp. April allows for reasonably warm weather but spring planting has not yet started. The schools are coordinated so that class sizes are balanced for each safety session. Each school transports their 3rd grade students to the farm as a half-day field trip. Students rotate through the safety stations every 15 minutes in class groups. The stations are conducted in machine sheds, tents and outside if weather allows.

A local implement equipment dealer provides an educational speaker and machinery for the PTO entanglement and lawnmower stations. An electric cooperative provides an electricity safety demonstration model with a presenter. The health department provides guest speakers and materials to discuss accidental poisonings. OSU Extension provides county educators, audio visual equipment and a flowing grain safety demo. An FFA Chapter provides student volunteers to help with set up and assist presenters. The Sheriff's office provides water safety equipment and presenters who use the farm pond for a station on water safety. The local fire department, ambulatory care center and emergency management agency simulate an emergency rescue for an ATV rollover accident that includes the arrival and departure of a life-flight helicopter.

Teachers escort their 3rd grade students from station to station providing organization and oversight. This also enables them to reinforce the materials taught within the classroom following the event. Because all participants are third graders, presenters are able to tailor all safety materials to be age appropriate and engaging for 8 and 9 year olds.

A wide variety of teaching methods are used at the various safety stations. The grain safety station is near a 40,000 bushel grain bin and a 600 bushel hopper wagon. A transparent table top demo is used to show how drowning can occur in flowing grain of wagons or grain storage bins.

The water safety station has a person needing help about 15 feet out in the farm pond. Students toss flotation devices to the distressed individual and are instructed that almost anything that floats can help. The poison station shows blue sports drinks that are similar to window wiper fluid and how similar the comet sink cleaner container is to the parmesan cheese container. These similar looking liquids and/or their containers can confuse youth and result in accidental poisoning. In addition, empty farm chemical containers are treated with a residue that can be revealed under a black light in order to demonstrate the importance of washing your hands after touching such containers.

The electricity station provided by the local electrical cooperative demonstrates how electricity seeks the most direct path to the ground. Hotdogs and toy soldiers become victims of downed power lines and kites accidentally caught in power lines. Youth learn to avoid power lines and report any downed lines to an adult.

The machinery entanglement station uses a combination of videos and a cordless drill to show how clothing can become entangled in rotating power shafts or equipment pinch points. At the firearm safety station, law officers discuss the importance of not handling guns without adult supervision and encourage youth to report any guns they may find. The tobacco station has a retired dentist showing pictures and videos of the harm that can come from tobacco products, especially smokeless tobacco.

In the simulated emergency rescue, a crash dummy is pinned under an overturned ATV in the farm driveway. Youth are lined up along the drive, and a tarp covering the accident is removed. The sheriff narrates what is happening as police and emergency rescue personnel arrive. A life flight helicopter landing finalizes the mock accident simulation. The mock rescue involves all the sirens and equipment of a real accident scene. After the rescue and a fly-over, the helicopter returns to the farm so that youth can look inside.

Assessment

Of the nearly 600 students attending the day camp in 2013, 524 completed a survey, yielding an 89% response rate. Of those 524 student surveys, 430 parent surveys were returned to the classroom teachers, representing 87% of the possible student-parent matched responses. Demographic descriptors indicate the population was 94% Caucasian and an equal split of boys and girls (n=262 respectively). Almost all campers reported they visited farms (94%). Approximately 48% of students indicated they lived in a rural area, 41.5% in the country and 9.4% on a farm. About 47% of the students lived near town (14.6%) or in a town (32.5%).Results also indicated 89% of students recalled a safety lesson they could use, 91% indicated the demonstrations held their interest and 93% indicated the presenters answered their safety questions clearly.

In 2010, parents were also surveyed about Farm Safety Day Camp. The majority of parents (80.0%) felt the program was a beneficial experience for their children, yet 59.9% would not have taken their child to a safety day camp if it were not part of a school field trip. One hundred and twenty five parents (26.8%) reported their children are practicing better safety behaviors since their day camp experience. Of interest to local program coordinators, 86 parents (18.5%) indicated they have tried to replicate and re-enforce the topics discussed.

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Exploring Agricultural Values: A Workshop on Different Agricultural Values for College Students who are Conducting Agricultural Literacy Activities

Introduction

America has split into differing agricultural value groups which some may broadly describe as conventional (i.e., large-scale production practices) and nonconventional (i.e., small-scale, organic) agriculturalists as well as consumerists. These groups have viewpoints, which can cause conflict. This divide has grown as the population has become more diverse and urbanized. Academia and agricultural leaders as a whole recognize the need to educate the general public on what today's agriculture represents. We have several College of Agriculture Sciences programs which focus on delivering agricultural literacy for the citizens of Colorado. Quite a few students in CSU's College of Agriculture Sciences volunteer to work with these agricultural literacy programs. While they typically enjoy this engagement with the general public, they also reported negative and even hostile interactions from people who did not agree with their agricultural values. In response to these concerns we have designed a workshop to address the difficulties of talking to people who have different sets of agricultural values. The workshop was designed to reduce and even mitigate the negative and hostile interactions our student volunteers were occasionally encountering.

Procedures

The major emphasis of the workshop was on how to find common talking points with people from differing value groups. This workshop included an introduction, three videos with discussion, and a summation. The workshop took about an hour. Frist, students learned that everyone has the right to have their own values, even about agriculture, and their job in promoting agricultural literacy was not to force people to change their values. Second, students were told that they were going to see three videos which might cause an emotional reaction. They were asked to watch each video with an open mind and try to hold back their emotions. They were asked to write down the values, truths, and deceptions they saw in each video.

The first video was a Gatorade commercial. There are a variety of Gatorade commercials which can work. We usually use a commercial featuring Kevin Durant and Dwayne Wade, two professional basketball players. The agricultural value displayed in the commercial was that many people see food only as a source of energy which can help them succeed (i.e., consumerist view). This value is sometimes lost on the participants and must be highlighted by the facilitator. While people who hold these consumerist values about agriculture may have a limited knowledge of agriculture, they have a basic knowledge of food (carbohydrates, fats, protein, etc.), which was exhibited in the Gatorade commercial. This basic knowledge of food was used as an opportunity to discuss the specifics of agriculture, including how production animals put on muscle through specific dietary patterns.

The second commercial was Chipotle's Scarecrow. This commercial typically draws negative reactions from students who are general conventional agriculturalists. I focus the students' attention on the truths and deceptions of the commercial they see. Students are told that this commercial represents only a small portion of Americans (i.e., nonconventional agriculturists); however, mass appeal of advertising and the subliminal messages behind this commercial provides the students with talking points. Facilitators need to help students to find some truth in the commercial, which usually centers on the acknowledgment that conventional agricultural practices sometimes rely on chemicals, antibiotics, and certain large-scale agricultural practices. Students should not shy away from these points because they seem controversial; rather, they should be honest to people about the logic, benefits, and risks of such practices. The commercial also argues for small-scale farming to produce healthy and enjoyable food. The healthy and local food values can be an interesting talking point for people with different views on agriculture.

The final commercial was Dodge Ram's (2013) God made a Farmer. This commercial often appeals to the students who generally agree with conventional agriculturalist values. Nonetheless, an honest discussion concerning the commercial's truths and deceptions is needed. Students often identify the themes which exaggerate the lifestyles of American agriculturalists. These include the messages that American agriculturists are rural, Christian, white, and hard working. We utilize these messages as talking points for the general public. People may have nostalgic views about agriculture, and this commercial reaffirms this misconception.

The last step of the workshop was to compare and contrast the values of the commercials. We try to find common ground, which will help students talk to people who have diverse values in agriculture. For instance, the God made a Farmer and Scarecrow commercials both highlight the benefits of small-scale production and family farming. Students should walk away with a sense of some commonalities across the agricultural values divide. These similarities can serve as discussion points when students are in front of the public and hopefully will help defuse potentially negative interactions.

Assessment

The workshop has been conducted twice for the College of Agriculture and has been well received each

time. The workshops last about an hour and each had over 20 attendees. Workshop attendees later reported having more confidence talking to people with different agricultural values. In addition, no negative interactions were reported between students and others with differing viewpoints during our agricultural literacy events. Most importantly, students learned how to initiate critical conversations about what they believe and why, which increases their own understanding about agriculture.

Submitted by:
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Cultivating Student Relationships in the Classroom

Introduction

Have you ever walked into a college classroom before class has started and heard nothing but silence? Then when class starts it is a challenge for the instructor to get the students engaged in meaningful discussion. When students feel comfortable in a classroom setting, they are more likely to talk with their peers and engage in the learning experiences provided by the instructor. In today's educational environment it is critical to prepare students that are capable of using critical thinking skills to solve real world issues. Additionally, employers often expect graduates to be able to work effectively in a team setting. In order to prepare students to work with other people and to be successful in their chosen field, classroom learning experiences should be designed to cultivate student relationships.

Procedure

The following is a list of methods that help to cultivate student relationships and create a sense of community in the classroom.

1. On the first day of class allow the students time to get to know one another and to become comfortable speaking to the entire class. Provide students with a prompt that encourages students to learn about each other.
2. Use icebreakers on the first day of class to ease the tension and promote the importance of student interaction.
3. Prior to your first class discussion set guidelines and expectations for the discussion. Taking the time to outline your expectations will allow for meaningful conversations throughout the entire semester.
4. Form small teams of students that will work together on assignments and in class learning activities.
5. Design learning activities that allow for students to solve complex issues when working together in teams. Allow the teams to use class time to work together on the learning activities in order to build relationships with each other and to collaboratively work on complex projects.
6. Design learning activities that promote regular student interactions.
7. When lecturing, take the time to pose questions and allow students to work together to answer the questions. After students interact with their peers, have multiple students share their answers with the entire class.
8. Form peer editing teams to allow the students to critique the work of other students. This will provide students with the opportunity to critically examine the work of others and to build relationships as they enhance their critical thinking skills.

Assessment

The above methods of cultivating student relationships in the classroom has helped to make the classroom environment more comfortable and conducive for student centered learning. Time spent on cultivating student relationships has allowed the students to become comfortable with one another and more willing to share their ideas with small groups of students and the entire class. The students no longer seem apprehensive to share their ideas with the class. Additionally, the students are much more accepting of each other's ideas and beliefs. Taking the time to foster student relationships in the classroom has turned the classroom into a room full of open discussion in which the student does not have to be concerned with being ridiculed for their opinions and ideas.

Submitted by:
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2014 NACTA Annual Conference

Montana State University hosted the 2014 NACTA Conference in Bozeman, June 25 – 28, where 300 people attended posters sessions, oral presentations, workshops, the business meeting and the awards banquet. The conference theme was: "Learning Runs Through It." NACTA expresses appreciation to Dr. Tracy Dougher and the local planning committee for a very successful conference.

The annual business meeting minutes, the NACTA Secretary/Treasurer's report follow.

NACTA Business Meeting Minutes Held in the Strand Union Building, Montana State University

The Business meeting was held at the end of the Thursday, June 26, noon luncheon beginning at 12:45 pm, approximately 170 people attended.

President Jeff Hattey called the meeting to order. First time NACTA Conference attendees were recognized. NACTA Executive Committee members were introduced. Thank you to Tracy Dougher, Conference Host Chairman, Montana State University. Thank you to first-time presenters at the conference.

Reports presented:

Secretary/Treasurer – Marilyn Parker
- ✓ Amount in NACTA checking account – approximately $60,000
- ✓ Approximately 200 members revolve in/out of NACTA each year
- ✓ 115 Institutions hold memberships
- ✓ 6 new life memberships
- ✓ Additional monies for administrative help
- ✓ Encouraged NACTA members to vote for officers

Journal Editor Report – Rick Parker
- ✓ Special September, 2013, International Journal Issue-36 submitted and 24 accepted
- ✓ 69 members on Editorial Board
- ✓ 250 Abstracts submitted for conference this year
- ✓ 4 Websites/Pages maintained
- ✓ For 2013 – 13 Teaching Tips submitted
- ✓ 28 graduate student poster contestants signed up
- ✓ Summary articles from the NACTA Journal were created for two-year colleges for recruiting purposes

Membership Chairman - Ron Hanson
- ✓ We have 30 NACTA ambassadors for regions: Eastern-4; Central-7; Western-7; and Southern-12; appreciation expressed for those who have volunteered
- ✓ Information paper on the luncheon table is to encourage NACTA memberships

Historian Report - Kevin Donnelly
- ✓ A PowerPoint presentation of NACTA past presidents was shown continuously during the luncheon
- ✓ Historical facts have been updated on the NACTA Website
- ✓ NACTA needs to work more closely with the Judging Conference; Drew Cotton is the contact this year for the NACTA Judging Conference at Black Hawk College, in Galva, Illinois. The contests will be held in Moline, Illinois, April 8-10, 2015.

Unfinished Business –
- ✓ Motion to approve University of Hawaii-Mânoa as Conference host for 2016 - **Motion passed**.

Election Results –
- ✓ President-elect – Tracy Hoover, Penn State University
- ✓ Central Region Director-elect – Lyle Westrom, University of Minnesota, Crookston
- ✓ Canadian Region Director-elect – Dana Penrice, University of Alberta

NACTA Business Meeting recessed for Foundation Meeting

NACTA Foundation meeting report
- ✓ Amount moved from NACTA Checking to Foundation $2205 ($5 per member)
- ✓ Amount moved from the Foundation to the Checking account for awards - $3500
- ✓ Amount in savings account at DL Evans, Rupert, Idaho - $13,864
- ✓ Amount in University of Wisconsin-Platteville Foundation account is $135,525.
- ✓ **Motion** to approve report passed.

NACTA Business Meeting reconvened.
Presentation from University of Georgia – Jean Bertrand, host Committee Chair for 2016 Conference.

Business Meeting adjourned at 1:30 pm.

Secretary's Report

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General
- ✓ Membership records maintained in Microsoft Excel
- ✓ Records include contact information (no phone numbers), payment type, membership code/ region, unique membership number (no credit card numbers are kept on file)
- ✓ Administrative side of the NACTA website provides tools to make better use of the data

Memberships – New and Renewals
- ✓ Emails sent to individuals in the fall with two reminders
- ✓ Payment taken by check, credit card (VISA or Mastercard) by PayPal (online), fax or mail, or by calling the secretary. Intuit Quickbooks is being implemented as well with *GoPayment* being used at this conference with iPads.
- ✓ Members continue to take advantage of the 3-year membership option
- ✓ New members receive a "Welcome to NACTA" letter through email and their name is given to the regional director. Regional directors also sent a letter of welcome
- ✓ Membership listings can be requested by regional directors; individual listings for a particular school can be/are requested for membership reminders or recruiting

Membership report –
- ✓ Institutions – 112
- ✓ Individuals – 600 (approximately)
- ✓ Libraries – 52
- ✓ Life Members – 125
- ✓ Turnover in memberships continues to be approximately 200 per year

Universities/Colleges –
- ✓ Institutions receive an email with an invoice for renewal in the fall; reminders are sent again in February and April
- ✓ New institutions: Illinois Central College, Peoria for the NACTA Judging Conference
- ✓ Noted improvement in obtaining payment for colleges participating in the NACTA Judging Conference
- ✓ Schools renewing after an absence: Kirkwood Community College, Cedar Rapids, IA; Oregon State University

- ✓ Those which pay for individual memberships (1-3 year memberships), or either a one-time payment, or a yearly renewal: Purdue University, University of Nebraska, University of Illinois, Texas A&M University, Commerce, Virginia Tech, Sam Houston State University, Huntsville, TX
- ✓ Colleges not renewed: SUNY Cobleskill, NY; Missouri State University, Springfield; BYU-Idaho
- ✓ *Note: If you are aware of changes in deans of schools, please let the secretary know*

Canada / Foreign Members, Institutions, Libraries (numbers included in above count)
- ✓ Canadian members – 8 / Foreign members – 3
- ✓ Institutions – 6
- ✓ Libraries – 2 Canadian / 5 Foreign

Teaching Award of Merit / Graduate Student Certificates
- ✓ Member institutions receive notification by email when they renew and another reminder in February or March for the certificates (we are willing to 'overnight' a certificate)
- ✓ Total 72 certificates awarded this year (48 Faculty and 24 Graduate students) which is an improvement from last year (50 total last year)
- ✓ Mix of NACTA member and non-member
- ✓ Continued importance and awareness of this award to institutions

Online Voting
- ✓ Approximately 80 votes were cast for the officer elections
- ✓ We are considering going back to the email voting procedure, possibly using the polling feature of email.

Action Item: Encouraging new memberships and retaining memberships is an ongoing theme. Why did 200 members not renew for 2014?

The NACTA Secretary appreciates the additional help of Karen Earwood, Miriah Pace and Nada Olson, with all aspects and the varied responsibilities of the NACTA work.

Submitted by Marilyn B. Parker
NACTA Secretary, June 2014

Treasurer's Report - June 2014

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Membership dues

- ✓ Major factor in keeping NACTA financially viable
- ✓ Critical to maintain current membership levels or increase
- ✓ Dues increase in June 2007 has been beneficial
- ✓ Three-year membership payment option is working well
- ✓ Also, those paying the life membership through the $200 per year plan is also working well
- ✓ Membership dues paid through PayPal or QuickBooks Intuit will save on credit card fees

Profit and Loss Statement

- ✓ Created by QuickBooks
- ✓ The accounting firm of Deagle & Ames in Twin Falls, Idaho conducted a compilation of the financial records of NACTA to verify the records and the accounting process
- ✓ This report is for the NACTA checking account only and maintained at DL Evans Bank in Rupert, ID
- ✓ Detailed Profit & Loss statement is available for any NACTA member

Income sources (additional)

- ✓ Virginia Tech 2013 Conference of $4660
- ✓ Silent Auction Books sales at the conference and through books donated by Cengage and sold online; these monies support the EB Knight, Jack Everly, and Bob Gough Teaching Tips awards
- ✓ Royalties from ProQuest and Gale (Cengage)

Donations

- ✓ CHS Foundation donation of $5000 received for the development and printing of the Awards Banquet Program booklet and Abstract booklet (Volume 58 Supplement 1) for all conference participants; this will show on next year's financial records as it was received the first week of June

Expenses

- ✓ Administrative help for the Journal, website upkeep, conference preparation, membership maintenance (individuals, institutions, libraries), and accountant help
- ✓ Scanning of all historical records and memberships continues
- ✓ Pre-Conference for Dr Y Lincoln was a loss of about $375

Bank Balance

- ✓ Bank statement for the checking account ending May 2014 is $60,680. (PDF of Disbursements attached separately)

Submitted by Marilyn B Parker
NACTA Treasurer, June 2014

NORTH AMERICAN COLLEGES & TEACHERS OF AGRICULTURE, INC.
STATEMENTS OF FINANCIAL POSITION
AS OF MAY 31, 2014 AND MAY 31, 2013

ASSETS

	May 31, 2014	May 31, 2013
Assets		
Cash	$ 59,766	$ 52,022
Total Assets	$ 59,766	$ 52,022

LIABILITIES AND NET ASSETS

	May 31, 2014	May 31, 2013
Liabilities		
None	$ -	$ -
Net Assets		
Unrestricted	59,766	52,022
Total Net Assets	59,766	52,022
Total Liabilities and Net Assets	$ 59,766	$ 52,022

NORTH AMERICAN COLLEGES & TEACHERS OF AGRICULTURE, INC.
STATEMENTS OF ACTIVITIES
FOR THE YEARS ENDED MAY 31, 2014 AND MAY 31, 2013

	May 31, 2014	May 31, 2013
Revenue, Gain and Support		
Membership dues	$ 62,216	$ 62,396
Royalties income	1,068	354
Foundation awards	3,500	4,000
Position announcements	100	550
Conference income	4,661	1,979
Miscellaneous income	1,976	1,475
Total Receipts	73,521	70,754
Expenses		
Awards	4,100	4,600
Bank charges	20	-
Conference expense	10,263	4,711
Credit card fees	1,010	1,437
Honorariums	20,244	24,134
Insurance	150	150
Journal expense	10,749	10,109
Miscellaneous expense	79	1,006
Office expense	193	-
Membership refunds	-	525
Postage	1,849	1,409
Professional fees	1,155	2,972
Meetings	544	662
Foundation dues	2,205	-
Administration	5,117	4,015
Supplies	1,010	878
Travel	3,439	3,869
Website expense	3,650	6,645
Total Expenses	65,777	67,122
Increase (Decrease) in Net Assets	7,744	3,632
Net Assets - Beginning	52,022	48,390
Net Assets - Ending	$ 59,766	$ 52,022

Welcome from the 2014 – 2015 NACTA President, Bonnie Walters

I would like to thank the membership of NACTA for having the confidence and trust in me to lead the organization in 2014-2015.

The NACTA Teaching Awards will be changing this year so make sure to look for them prior to submitting nominations. Our conference in June at Montana State University included some great discussions on teaching and learning, with a fantastic atmosphere to inspire us.

NACTA in 2014-2015 will be expanding its involvement in the NACTA judging conference and with undergraduate and graduate students. The Executive Committee is always looking for ways to increase our impact in teaching and learning in agriculture. We have been able to improve our commitment to the International Committee with Pre-conference meetings and a special edition of the NACTA Journal because of membership interest.

Future NACTA Conferences will be at the University of Georgia in 2015 from June 16 to June 20 in Athens, GA and the University of Hawaii System in June, 2016. We are looking for future conference sites, so if you are interested please contact me.

As we begin a new academic year I hope everyone will utilize the NACTA Journal, the teaching tips, and the professional connections you have created within NACTA to improve your teaching, and to inspire and challenge your students.

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Join NACTA today!

(North American Colleges and Teachers of Agriculture)
**— a professional organization dedicated to advancing the scholarship of teaching**
and learning in agricultural, environmental, natural, and life sciences.

- Members have online access to the quarterly NACTA Journal, a professional, peer reviewed journal emphasizing the scholarship of teaching. At the end of the year, members receive a hardcopy of the Journal that combines the quarterly issues. The Journal also includes book reviews, teaching tips, and conference abstracts.
- Members attend the annual conference held at different colleges and universities in the U.S. and Canada, and where members present papers on innovative teaching concepts.
- Each year NACTA recognizes outstanding teachers with a variety of awards including: Teaching Awards of Merit, Teacher Fellows, Regional Outstanding Teacher Awards, NACTA-John Deere Award, Teaching Award of Excellence, Distinguished Educator, and Graduate Student Teacher Awards.

To become a member register online at
http://www.nactateachers.org/online-membershipapplication-renewal.html
or complete and mail in the following form.

Membership Categories (check one):
❑ Institutional Active Dues are $75/year (if your University/college is a member)
❑ Active Dues are $100/year
❑ Graduate Student $25/year
❑ Emeritus $25/year
❑ Lifetime $750 if made in one payment (or $800 if made in four payments of $200)
❑ Institutions $150 for 4 year schools and $100 for 2-year schools
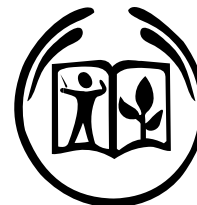
Name:	Email:
Institution:	Telephone:
Address 1:	
Address 2:	

City:	State:	Zip:

Send a check payable to NACTA for the correct amount or you can pay using a credit card (VISA and MasterCard only); phone calls also accepted 1-208-436-0692:

Name on Card:_____

Card Number:_____

Expiration (month/date):_____

Three digits on the back of your card to the right

of the signature block: _____

Send your completed form to:

Marilyn B. Parker
NACTA Secretary/Treasurer
151 West 100 South
Rupert, ID 83350

For more information visit the NACTA website:
www.nactateachers.org
or email nactasec@pmt.org

NACTA Committee Members
2013-2014*

Journal Awards
Crystal Allen, Chair
University of Illinois
callen@illinois.edu

Membership & Public Relations
Ron Hanson, Chair
University of Nebraska - Lincoln
rhanson1@unl.edu

Jeannette Moore, Co-Chair
North Carolina State University
Jeannette_Moore@ncsu.edu

Educational Issues & Teaching Improvement
Kimberly Moore, Chair
University of Florida
klock@ufl.edu

NACTA Teacher Recognition Committee
Nick Fuhrman, Chair, University of Georgia
Grace Arman-Agyeman, SW MN St University
Kirby Barrick, University of Florida
Michelle Burrows, University of Nevada, Reno
W. Stephen Damron, Oklahoma State University
Sam Doak, Virginia Tech
Kevin Donnelly, Kansas State University
Will Farmer, North Carolina State University
Harry Field, Oklahoma State University
Jean Gleichsner, Fort Hays State University, KS
Kelsey Hall, TX Tech University
Lynn Hamilton, California Polytechnic State University
Alan Hansen, University of Illinois
Ronald J. Hanson, University of Nebraska-Lincoln
Cindy Haynes, Iowa State University
Jennifer Henke, University of California
Robin Peiter Horstmeier, University of Kentucky
Dann Husmann, University of Nebraska-Lincoln
Donald M. Johnson, University of Arkansas
David Jones, North Carolina State University
Prasanta Kalita, University of Illinois
Angela Kent, University of Illinois
Thomas Kuzmic, Oklahoma State University
Mickey Latour, Southern Illinois University
Lurline E. Marsh, University of Maryland
Ed Miller, Oklahoma State University
Greg Miller, Iowa State University

Foy Mills, Sam Houston State University
Jeannette Moore, North Carolina State University
Michael D Mullen, North Carolina State University
Tory Parker, Brigham Young University
Nick Paulson, University of Illinois
Greg Pillar, Queens University, NC
Marcus Pollard, University of Georgia
Bryan Reiling, University of Nebraska

Herman A. Sampson, North Carolina State University
Shelly R. Sitton, Oklahoma State University
Ray Smith, Abraham Baldwin Ag College, GA
Robert J. Stephenson, Fort Hays State University, KS
Kirk Swortzel, Mississippi State University
Elaine Turner, University of Florida
Bonnie Walters, University of Wisconsin, River Falls
Wendy Warner, North Carolina State University
Jerry Williams, Virginia Tech
Dean Winward, Southern Utah University

Liaisons
NACTA Judging Contest
Lyle Westrom, University of Minnesota, Crookston

Delta Tau Alpha
Jean Gleichsner, Fort Hays State University, KS

AASCARR
Billye Foster, Tenn Tech University

APLU
Jean Bertrand, University of Georgia

CFAVM & CADAP
Kent Mullinix, Kwantlen Polytechnic University, Surrey, BC

CAPICU
Ed Brokaw, Abilene Christian University, TX

International Committee
Laura White
New Mexico State University
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Nominating
Jeff Hattey
The Ohio State University
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NACTA Foundation Advisory Council
Jeff Hattey
The Ohio State University
hattey.3@osu.edu

* If you are interested in serving on one of the committees contact the Chair.

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