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A Descriptive Study of High School Agriculture Teachers Competencies in Swaziland

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Abstract

A descriptive study was utilized to determine competence level of high school agriculture teachers regarding curriculum reforms in Swaziland. The objectives of the study were to describe current competencies possessed by selected high school agriculture teachers and to identify knowledge gaps of high school agriculture teachers on the new topic contents included in the Swaziland General Certificate of Secondary Education (SGCSE) agriculture syllabi and to assess the availability of teaching facilities. To collect data for this study, observational data collection procedures were employed. A total of eight agriculture teachers from the four regions of the country were observed to assess their competencies on organizing and planning for lessons, command of the subject matter, classroom management, innovative teaching, method of instruction and assessment of the SGCSE agriculture curriculum. A content analysis procedure was also employed to assess objectives, content topics contained in the syllabi, learning approaches used, available teaching facilities and assessment used. Findings from observations showed that agriculture teachers had high competence levels in planning and organizing for lessons, command of subject matter and classroom management. Teachers also demonstrated lack of expertise in innovative teaching, incorporating educational technology in method of instruction and assessing practical skills and ability. Based on the findings of the study, a conclusion drawn was that while high school agriculture teachers had high competence levels in the key aspects of teaching and learning process, they had low competencies in teaching the new content topics included in the SGCSE agriculture syllabus and needed in-service training on the new topics. A study involving survey on high school agriculture teachers is recommended to determine their perceived competencies in addressing the new objectives incorporated in the SGCSE agriculture syllabus, as well as teaching the new content topics incorporated in the SGCSE agriculture syllabus.

Key words: Competence, content analysis, curriculum, IGCSE, high school agriculture teachers, SGCSE, agriculture.

Introduction

Education is viewed as a primary means of solving social problems (Worthen and Sanders, 1987; Freire, 1973). Burrow and Farmer (1988) further stated that education is one of the primary resources for social and economic changes and improvement. The Swaziland National Development Plan (1973 – 1977) recognized the efficiency in the school system was limited by its inherent academic orientation. This underscores the need for reorienting the curricula at primary and senior secondary schools, to counteract prevailing non technological bias and enable students who graduated to move more naturally into available employment opportunities.

The introduction of agriculture in schools was one attempt to address the inadequacies of the school system in relation to the future prospects of students who graduated. Agriculture is the most important economic sector followed by manufacturing in Swaziland (Dlamini, 1986). Introducing agricultural curriculum into African schools was generally hailed as a panacea for agricultural development. The introduction of the Schools Agriculture Program is regarded as the most educational innovation in Swaziland (Gooday, 1974). The Schools Agriculture Program was launched in 1973, as an initiative to introduce practical subjects in the school system. It represents one strategy for implementing the objectives of the Second National Development Plan, to reorient the senior secondary school curriculum away from its non-technological bias (Sullivan, 1981). Rivera and

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Zijip (2002) presented evidence that radically different institutional arrangement in agricultural education and extension is in an increasingly large number of countries.

The Government of Swaziland underscores the fact that the country is currently faced with socio-economic challenges such as: poverty, high unemployment rate, HIV/AIDS, increased competition in Direct Foreign Investments and global competition in products and market conditions. In response, educational reforms were made through the inception and subsequent implementation of the Swaziland General Certificate of Secondary Education (SGCSE) agriculture syllabus, replacing the International General Certificate of Secondary Education (IGCSE) agriculture syllabus in 2010 (Ministry of Education, 2009).

Curriculum changes are basically responsive to political and socio-economic challenges. There was a significant challenge in place with the agriculture curriculum relevant to keep paces with changes new curriculum content. Such curriculum modification in the modern era of technology more often than not, demands changes in pedagogy, hence teacher competence is consistently challenged (Wallance, 1996; Ottevager, 2001; and Taylor, 2000). However, due to demographic changes in the society and fast-changing fields of agriculture and rural development, there is a significant challenge in keeping the agriculture curriculum relevant, more often than not to keep pace with the technological advancements and the ever-changing yet very volatile socio-economic challenges.

Since the inception and subsequent implementation of the SGCSE agriculture syllabus, teacher professional competencies has neither been developed nor assessed. There were new additional objectives and new topic contents incorporated and the question was, how are high school agriculture teachers coping with the implementation of the syllabus? What knowledge gaps, if any, existed in as far as the teaching and learning of agriculture was concerned. There was a need to investigate teacher competence levels in teaching the SGCSE agriculture syllabus. Currently, there is no systematic documentation in Swaziland on professional competencies of the SGCSE agriculture teachers. Hence, a gap in the literature existed and this investigation was conducted to begin a process of assessing the competence of high school agriculture teachers in Swaziland.

Theoretical Framework

Findlay and Drake (1989) suggested that competence in one's professional role is important in the overall learning process, while Ready (1967) described competence as a motivational factor that is responsible for individual achievement. Sarbin (1954) emphasized that a person that cannot enact a role for which one lacks the necessary role expectation. Hertling (1974) assumed that required competencies can be identified and an educational program can be conceived which will enable the participants to develop those competencies.

Schamhart and van den Bor (1994) stated that training needs analysis may be carried out when intending to implement curriculum reforms. Taylor (1997) strongly advocated for involvement of teachers and other stakeholders in curriculum development. Newcomb (1974) noted that there are numerous lists of competencies in agricultural education, but little is known regarding which competencies are related to success. Cook (1963); and Stewart et al., (1983) focused on compilation of competencies needed by agricultural education teachers to be successful and major determinants were found to be knowledge of subject matter and ability to execute the necessary agricultural practical skills.

Attitude, demographic characteristics, work experiences and perceived levels of competence are indicators of the teacher's ability to perform effectively professional roles complex interplay (Findlay, 1989). Fishbein and Ajzen (1975) indicated that attitudes are necessary precursors to changing behaviors. Theories on attitudes suggest that cluster feelings, beliefs or behaviors are relatively lasting and that there is a relationship between attitude and competence level (Swanson, 1972; Findlay, 1972; and Wiley et al., 1997). These studies also found that individuals with positive attitudes toward a discipline tend choose or perform highly in that discipline and this positive attitudes is maintained permanently.

According to Kiernan (2004), one of the most under used data collection method is observation. Observation can be used to qualitatively assess and evaluate many physical aspects of an environment such as a school by using a combination of observation and an interview. Kiernan (2004) further stated that observations are useful when the subjects cannot provide information or can only provide inaccurate information.

Taylor-Powel and Steele (1996) stated that observation is a way of gathering data by watching behavior, events and noting physical characteristics in their natural setting. There are many types of observation, direct or indirect, participant or non-participant, obtrusive or non-obtrusive, structured or non-structured. Direct observation is when you watch interactions, processes, or behaviors as they occur; for example observing a teacher teaching a lesson from a written curriculum to determine whether they are delivering it with fidelity. Taylor-Powel (1996) further stated that observation is ideal when collecting data from individual is not a realistic option, if respondents are unwilling or unable to provide data through questionnaires or interviews and it allows the researchers to directly see what people do rather than relying on what people say they did.

The advantages of observation as a method of data collection is that data can be collected where and when an event or activity is occurring, it does not rely on people's willingness or ability to provide information and it allows the observer to directly see what people do rather

than relying on what people say they did. However, the disadvantages of observation are that its susceptibility to observer bias, susceptibility to the "Hawthorne effect," that is, people usually perform better when they know they are being observed, although indirect observation may decrease this problem, it can be expensive and time-consuming compared to other data collection methods and it does not increase the observers understanding of why people behave as they do.

Purpose and Objectives

The purpose of the study was to observe and record competence attributes of high school agriculture teachers regarding curriculum reforms in the Swaziland high school agriculture curriculum. The objectives of the study were to:

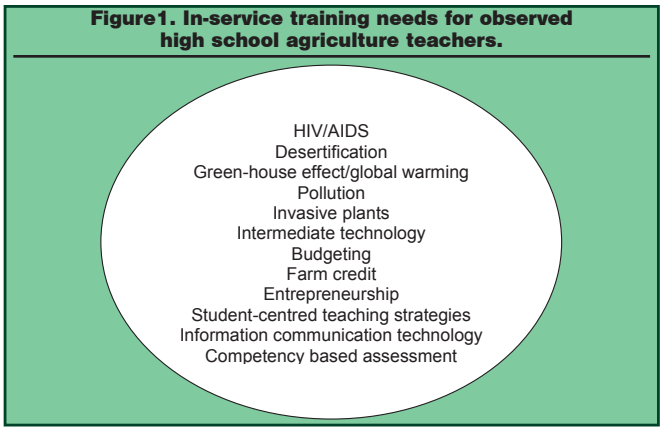
1. Describe current competencies possessed by selected high school agriculture teachers.
2. Identify knowledge gaps of high school agriculture teachers on the new topic contents included in the SGCSE agriculture syllabus.

Methodology

The study was designed to be descriptive in nature, employing qualitative data collection procedures. The target population of the study included all high school agriculture teachers employed by the Government of Swaziland (N= 134). In order to control for frame error, an up-to-date list of high school agriculture teachers was obtained from the Schools Agriculture senior inspector in the Ministry of Education. The participants in the study included a sample of eight teachers (n= 8) drawn from the target population for observation. The sample was further stratified according to the four regions of the country, two teachers per region and one being from a mission school and the other, came from a public school. The criteria used by the researchers to only observe eight schools, was based on the fact that the researchers wanted to obtain relevant data with depth.

In this study, observation was used to determine agriculture teacher's competence in teaching the SGCSE agriculture curriculum. According to the consultative document, for effective implementation of the SGCSE syllabus, teachers needed to show competence in planning and organizing materials in form of audio visual aids, teaching equipment, planning activities, using recommended teaching methods and crafting innovative teaching strategies (Ministry of Education and Training, 2010). However, obtaining such information from respondents was not realistic and respondents were less likely to provide accurate information about their competence thus observation was the only suitable data collection technique.

Figure1. In-service training needs for observed high school agriculture teachers.



Observation instruments were also developed as tools for actual teaching, lesson plans, checklist for teaching facilities and field notes after extensive review of literature. A panel of experts reviewed the instruments and attested to their content validity. In this study high school agriculture teachers were observed for a term (12 weeks), to determine teacher competencies in teaching the SGCSE agriculture syllabus. To obtain in depth information and explanations, observations were conducted together with interviews. A scheme book, lesson plan and a daily preparation book were reviewed and questions were sought for clarity. Observations were also recorded in the field book in a form of field notes to be used later for data analysis and interpretation.

Data collected from observations were analyzed using content analysis procedures and summarized in descriptive form in relation to knowledge and skills observed in the teaching and learning processes. The observed data were inductively developed into a list and then presented using tables. Trends and patterns on observed and unobserved skills were used to identify in-service training needs for high school agriculture teachers in Swaziland.

Findings

Objective 1 of the study was to describe current competencies possessed by selected high school agriculture teachers in Swaziland. Agriculture teachers were observed to assess their competencies on: organizing and planning for lessons, command of the subject matter, classroom management, innovative teaching, method of instruction and assessment of the SGCSE agriculture curriculum (Table 1).

Teacher's Competencies on Organizing and Planning for Lessons

Young (1990) identified the ability to plan and execute lessons as one of the basic skills in teaching agriculture, since agriculture is skill based. The findings of the study indicated that agriculture teachers have high competence levels in organizing and planning for lessons. The observed agriculture teachers demonstrated high competence levels in organizing and preparing audio-visual aids, scheming of work, providing students with a syllabus, recording work done, developing lesson plans, stating lesson objectives, good time management skills, coordinating agricultural activities and locating and selecting student references and materials for further reading.

Table 1. The list of teacher activities observed that relate to teacher competencies

Teacher competence	Teacher activity
1. Organizing and planning for lessons	Agriculture teachers organized and prepared teaching materials, scheme of work, provided students with syllabi, developed lesson plans, stated lesson objectives, and demonstrated good time management as agriculture teachers arrived in time in class and also left just immediately the bell has rung. Teachers coordinated agricultural activities with the colleagues and the administration. Teachers helped student to select and locate reference material for further reading.
2. Command of subject matter	To demonstrate command of the subject matter, agriculture teachers; gave a variety of relevant examples, posed questions to students in class, answered students in class and handled questions very well, organized lessons such that they reflected lifelike situations, and related current lesson to past lessons. Teachers were very creative in preparing teaching aids and they were correctly used, captured teachable moments with ease, and allowed creativity on the part of students. Teachers utilized appropriate and adequate teaching facilities as they used real objects or models, they demonstrated masterly of principles of learning as they passed comments on student performance as reinforcement.
3. Classroom management	Agriculture teachers were competent in classroom management in that, in that they demonstrated good human relations as it was evident that teachers had good relationship with colleagues and students. Teachers guided and supervised students practical's with ease, were able to create a conducive learning environment, allowed few distractions and interruptions, carefully moved around the classroom, and gave clear directions. It transpired that most agriculture teachers had established a set of rules to manage student behaviour. Teacher was time conscious, and had long range plans to improve student performance. Teachers demonstrated good chalkboard use and management. Most teachers confronted students for noise, late coming and not doing assigned tasks, and they constructively criticized students for educational improvement. Almost all teachers demonstrated a friendly and respectful relationship with students, and they recognized and appreciated student effort.

Teacher's Competence Levels on Command of the Subject Matter

The findings of the study revealed that agriculture teachers observed a high command of the subject matter. Observed teachers organized their lessons and reflected "lifelike" situations, to trigger students thinking on how learned information can be used in real life situations. Teachers ensured their lessons were student-centered and problem based, in ways that encouraged students to brain storm possible solutions that could address current problems recurring in every-day life in most communities. Teachers demonstrated an ability to give various relevant examples and handled students' questions very well.

Teacher Competence Levels on Classroom Management

Larsen (1992) and Miller et al. (1989) identified classroom management and organization as influencing the effectiveness of agriculture teachers. The findings of this study indicated that agriculture teachers had high competence levels in classroom organization and management. Teachers were able to guide and supervise students and created conducive learning environment. They indicated that they were effective teachers since they minimized wasting of time, allowed few distractions and interruptions; carefully moved around the classroom; and gave clear instructions. From the observations, the conclusion was that, almost all the observed teachers had established a set of rules and procedures to manage student behavior, absenteeism and noise making.

Teachers' Competence Levels on Innovative Teaching

Observations of teachers suggested that agriculture teachers lacked competence in innovative teaching. Observed teachers lacked the skill of developing an understanding with students such that, the students are actively engaged in the teaching and learning process. Teachers lacked creativity and thus failed to provide the stimulus upon which students can reflect on, share different experiences, interpret phenomena and become aware of their prior knowledge, connect it to what they already know and construct their own "new" information, upon which they can apply to solve different problem situations. Agriculture teachers were unable to develop and secure a desirable learning approach, which stimulates interest, develops thinking ability and helps students to evaluate, draw inferences from and make decisions essential to the solution of a problem, which is invaluable in agricultural education.

Teachers' Competence Levels on Method of Instruction

Mbingo (2002), suggested that teaching agriculture should be practical oriented; competence based; employ discovery learning, investigatory approach, research based and problem based learning - that seek to probe students on current problem and brainstorm on possible solutions to existing problems. The findings of the study revealed that the teaching of agriculture was still dominated by the old and trusted traditional methods of instruction, the lecture, demonstration and classroom discussion methods and the approach was still teacher centered. Teachers demonstrated average competence on oral presentations, debates, case studies and research. Observed teachers demonstrated low competence levels on using field trips, resource persons, role playing, problem solving, modular teaching, cooperative learning, inquiry learning, experiential learning and value clarification (Table 2).

Teaching Resources Available to Teach Agriculture in High Schools

Shelhamer (1993) stated that facilities and materials are crucial in agricultural education since they provide students with opportunities for experiential learning and diverse learning styles, which is more ideal in agricultural education instructional systems. The results of the study indicated that most of the schools provided teaching materials ideal for the old and tested teaching methods such as the lecture, classroom discussion and demonstration (Table 3). Almost all the observed schools had an adequate supply of facilities that aid

Table 2. Teacher competence and methods of instruction

Method of instruction	Comments on teachers competence in planning, use and actual implementation
Mostly used methods of instruction Lecture Classroom discussion Demonstration	Agriculture teachers demonstrated high competence levels in planning for lecture, classroom discussions and demonstrations. Teachers seem comfortable and familiar in using these methods of instruction
Averagely used methods of instruction Oral presentations Debates Case studies Research	Agriculture teachers showed average competence in using these methods of instructions. These methods of instruction were rarely used and when used they were not used correctly. Teachers' seemed to be nervous and they were not sure with what they were doing. Only two teachers of the observed teachers proved to be competent in oral presentations.
Methods of instruction never used Field trips Resource persons Role playing Problem solving Modular teaching Cooperative learning Inquiry learning Experiential learning Seminars Value clarification	The results of the study revealed that agriculture teachers never used these methods of instruction. Lack of teacher competence on using these methods contributed to these methods of instruction not being used. In some rare cases where agriculture teachers declared their competence in using these methods of instruction, it transpired that lack of resources and facilities in the school limited the teacher on using some methods of instruction.

theory, basic knowledge and understanding such as text books, posters, charts, maps, chalk, chalkboard, classrooms and classroom furniture. However, tools that aid practical skills and abilities such as garden tools, pH test kits, soil auger, small livestock and fruit trees were in limited supply. The findings of the study further revealed that schools struggled to provide adequate technology related equipment such as videos, computers and accessibility to internet, audio cassettes, television, digital cameras, USB flash drives and CD ROMS. The results of the study further revealed that only prevocational schools on the observed schools were able to provide skill aiding equipment. Observations suggested that all the prevocational schools had adequate teaching facilities in computers, green houses, refrigerators, laboratories, access to internet, video cassettes, seed trays, gas cylinders, electric heaters, brooders, printers, clocks, bee hive boxes and sprinklers and various first class animal houses in their agriculture department.

Teacher Competencies on Assessment of SGCSE Agriculture Syllabus

The findings of the study indicated that a majority of teachers tend to use assessment only to collect scores for learners and not to improve teaching and learning. The type of test teachers gave students were merely examining students on knowledge and understanding and less on handling information and problem solving. Agriculture teachers did not formulate their own questions but used past exam papers to drill students. Agriculture teachers did not analyze the tests according to their level of difficulty to identify weaknesses of the learners or work on concepts they find to be most challenging to the students. The findings of the study further indicated that agriculture teachers lacked competence in assessing practical skills and ability. Teachers struggled to construct and formulate six good practical exercises assessing students on responsibility, initiative, technique, perseverance and quality. Teachers failed to account for marks awarded to students and failed to provide supporting evidence that practical's were carried out. However, teachers demonstrated high competence levels on assessing investigatory projects.

Identified Knowledge Gaps in Teaching the New Topic Contents Included in the SGCSE Agriculture Syllabus

Objective 2 of the study was to identify knowledge gaps of high school agriculture teachers on the new topic contents included in the SGCSE agriculture syllabus. Barrick et al. (1983) stated that the identification of relevant topics can be crucial in providing agriculture teachers with quality in-service training. The findings of the study revealed that curriculum reforms incorporated new topic contents addressing current socio-economic challenges, hence observed agriculture teachers alluded to the need of in-service training on the following topics: HIV/AIDS, Desertification, Green-house effect/ global warming, Pollution, Invasive plants, Intermediate technology, Budgeting, Farm credit and Entrepreneurship. Through scheduled interviews during observations, agriculture teachers highlighted to indicate a need for in-service training on the new topic contents, student-based method of instruction and use of information communication technology and multi-media in teaching and learning process.

Table 3. Teaching facilities available in the agriculture department in most high schools in Swaziland

Teaching facilities	Comments on availability
Teaching facilities available in most schools Chalk and chalkboard, text books, pH test kit, nutrients test kit, classrooms, classroom furniture, garden tools, continuous assessment record books, maps, posters, small livestock, and fruit trees.	Most schools provided these teaching facilities in adequate supply.
Teaching facilities available in some schools Videos, computers, access to internet, television, digital cameras, USB flash drives, audio cassettes, soli auger	Some schools struggled to provide these facilities, however they were in limited supply. In some cases, these facilities were not only for agriculture department but rather for the school and all departments were entitled to use them.
Teaching facilities not available in most schools Department computers, printers, refrigerator, soil auger, soil dispenser, laboratories, cattle, goats, green houses, sprinklers, brooders, bee hive boxes, electric heaters, clocks, seed trays, television set, DVD players, digital cameras, 48 kg gas cylinders, and various first class animal houses.	These teaching facilities were not available in most of the observed schools. It is however, worth to note that the three prevocational schools observed, Lavundlamanti, St Philips and Salem high schools provided these equipment at departmental level and in adequate supply.

Conclusions

This observational study of a sample of teachers suggest that high school agriculture teachers are competent in key aspects of teaching and learning process, since they were highly competent in organizing and planning for lessons, command of subject matter and classroom management. This implies that high school agriculture teachers possess the qualities of effective teachers and can successfully implement the SGCSE agriculture syllabus if given the necessary support in provision of good infrastructure and in-service training on identified in-service training needs.

The study was limited to a small number of observations. Meaning there is a need to conduct a more comprehensive quantitative study to determine high school agriculture teacher's perceived competencies on addressing the new objectives incorporated in the SGCSE agriculture syllabus and as well as teaching the new content topics incorporated in the SGCSE agriculture syllabus.

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Repeated Monitoring of Forest Plots: Evaluating the Accuracy of Student Scientist Data[1,2]

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Abstract

The accuracy of vegetation data collected from permanent forest plots by Virginia and Georgia high school citizen scientists was compared against an expert-developed answer key. Several factors appear to influence citizen scientist data collection accuracy, including education of trainers, biodiversity of vegetation plots, whether students enrolled in an elective or required science course and plot preparation. When university faculty provided training for the high school students during data collection, they achieved 96% accuracy on measuring tree diameters. When undergraduate students provided the training, the accuracy of tree diameter measurements declined to 75%. A forest's species diversity also influenced data accuracy, with students who measured the more-diverse forest in Georgia being able to identify 80% of the trees correctly, while students working in the less-diverse Virginia forest were able to identify 97% of the species correctly. High school students enrolled in elective agriculture or environmental science classes measured tree diameters more accurately (78% accuracy) than students who were enrolled in mandatory science classes (69% accuracy). The accuracy of data collected by high school citizen scientists increased in plots where researchers placed metal tags on all trees that needed to be sampled (6% error rate), rather than having students establish the plot dimensions with measuring tapes and determine for themselves what trees were in or out of their sampling plot (95% error rate).

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Introduction

Citizen science programs provide hands-on learning opportunities to engage students in all aspects of science. Through these programs, students can learn about ecosystems, biodiversity and wildlife-habitat relationships all while participating in the active collection of data to address scientific research objectives (Bonney et al., 2009). Citizen scientist programs have the dual goals of contributing to the advancement of scientific knowledge while expanding scientific literacy. When these programs specifically target youth they increase the awareness and appeal of science as a career option (Jenkins, 2011). For students, citizen science programs link classroom content with everyday life by moving scientific material from a theoretical to a tangible form and allow students to be active learners. Science educators find citizen scientist programs valuable for high school students who do not respond well to traditional teaching methods because these experiences provide diversity in the physical and intellectual learning environment (Jenkins, 2011).

High school students who participate in citizen scientist programs tend to fit into two groups: students participating as part of a school-based project or students participating under the guidance of a parent or other adult (Galloway et al., 2006; Delaney et al., 2008; Weckel et al., 2010). School-centered programs can be incorporated into class projects that rely on traditional grading systems or teachers can encourage students to participate in programs that occur outside of normal classroom-based activities through small gift incentives (Galloway et al., 2011). Students who participate in non-school based citizen scientist programs often work under the guidance of adults through organizations such as 4-H, FFA, Boy or Girl Scouts of America, or with local parks or wildlife refuges.

One common concern with data collected by citizen scientists, especially when working with student citizen scientists, is whether the data collected by volunteers are accurate. When assessing "accuracy" of data the use of a reference point of the existing conditions is important. Some studies professing to assess the accuracy of citizen scientist data have instead assessed the reliability of the data. In this sense, reliability is how similar data collected by two groups are to each other. For example, data collected by citizen scientists were compared to data collected by other citizen scientists from the same site or to data collected in similar studies in the same region to determine reliability (Weckel et al., 2010; Jordan et al., 2012). Selecting an appropriate reference point for assessing the accuracy of data collected by citizen scientists is difficult. However, the root of the question is whether the data collected by citizen scientists is less accurate than what would have been collected by trained scientists; therefore, comparing citizens' data to data collected by professional scientific researchers appears to be the best approach (Gillett et al., 2012; Jordan et al., 2012). To accomplish this, one assessment approach is to have synchronous data collection, in which both citizen scientists and professionals collect data at the same time and location and then compare the results (Delaney et al., 2008; Galloway et al., 2011). An alternative approach is to have research professionals collect the data in advance and then compare the citizen scientist data with the professional standard or benchmark (Crall et al., 2010).

The objective of this study was to assess the accuracy of high school student collected data from projects that involve re-sampling permanent forest plots. Three research questions guided the study:

1. How accurately can high school students collect tree diameter data (compared to an established answer key)?
2. How accurately can high school students identify trees within fixed area plots with the aid of a site specific dichotomous key?
3. Is data collection accuracy influenced by the scientific background of the adult instructor in high school citizen scientist programs?

For the current study, high school environmental science/earth science students completed five sampling periods at Mason Neck National Wildlife Refuge in northeastern Virginia (N 38°40'38", W 77°15'52") as part of their science coursework and high school agriculture students completed two sampling periods at Indian Springs State Park in central Georgia (N 33°14'50", W 83°55'19"). At both of these study areas, prior data were collected by researchers from Virginia Tech and the University of Georgia to provide a baseline (answer key) for comparing the accuracy of the student collected data. The students collected the data during a full-day field trip that was a part of their normal school curriculum.

Materials and Methods

Study Areas and Partnerships

Partnerships were established with teachers and high schools in Virginia and Georgia, which resulted in seven outdoor citizen scientist field trips during three consecutive years (Table 1). However, these sessions should not be viewed as replications because the experience was an iterative process in which revisions were made to the teaching approaches each time in an attempt to improve the educational experience and the quality of data collected by the students. Prior to student data collection, we established permanent plots (0.02 ha) with a wooden stake marking the plot center for a plot with a radius of 8 m. Species and diameter of all trees exceeding 10 cm diameter at breast height (DBH, 1.4 m) were carefully measured and recorded by experienced university researchers. We developed a project-based website for both the Virginia (http://dendro.cnre.vt.edu/mason/) and Georgia (http://dendro.cnre.vt.edu/indiansprings/) field sites to prepare students for their experience prior to leaving the classroom. The website included environmental and historical information about the field site, identified the research objectives, described

Table 1. Summary of the seven citizen scientist experiences. High school citizen scientists came from environmental science and earth science classes at Freedom High School (FHS) and Patriot High School (PHS) in Virginia and agriculture students at Locust Grove High School (LGHS) in Georgia.

Teaching Sessions[w]	Educational Site[y]	High School	Instructors[z]
1	MNNWR	FHS	VT faculty
2	MNNWR	FHS	FHS teachers
3[x]	MNNWR	FHS	VT faculty, grad students, FHS teachers
4[x]	ISSP	LGHS	VT forestry undergrad students
5[x]	MNNWR	FHS	VT forestry undergrad students
6[x]	ISSP	LGHS	VT forestry & UGA agricultural communications undergrad students
7[x]	MNNWR	PHS	VT forestry & UGA agricultural communications undergrad students

[w] Teaching sessions were held between 2008 and 2011.

[x] Numbered tree tags placed at breast height on all trees within permanent sampling plot and group leaders were provided answer keys.

[y] MNNWR - Mason Neck National Wildlife Refuge (N 38°40'38", W 77°15'52") and ISSP - Indian Springs State Park (N 33°14'50", W 83°55'19").

[z] Instructors included faculty, graduate students, and undergraduates from Virginia Tech (VT) and University of Georgia (UGA) and high school teachers from Freedom High School (FHS).

the field methods, had site-specific tree keys and hosted an electronic data entry form where the students would enter collected data, under the supervision of the high school teacher. Prior to each citizen scientist session, university faculty met with high school science teachers for a half-day training. Training involved classroom work to familiarize the teachers with the project's objectives and website. The training also included an outdoor practicum at the field site to demonstrate the sampling techniques students would use and reduce any anxiety of the teachers.

During the citizen scientist sessions, high school students sampled the permanent vegetation plots and recorded tree species and DBH at both sites. Five of the seven sessions were located at Mason Neck National Wildlife Refuge in Virginia with four involving high school students from Freedom High School (an environmental science magnet school) and one with students from Patriot High School. Two of the citizen scientist sessions were located at Indian Springs State Park and involved high school students from Locust Grove High School in Georgia.

The first data collection occurred at Mason Neck National Wildlife Refuge in the fall of 2008 and partnered high school students from three different classes at Freedom High School with faculty from Virginia Tech (Table 1). The faculty taught the high school students how to use different sampling tools and led the students through the sampling of the permanent vegetation plots. The high school students then returned to their classrooms to enter the data into the project website.

The second citizen scientist data collection session occurred at Mason Neck National Wildlife Refuge in the spring of 2009 and was different because it involved Freedom High School teachers leading a different group of students through the same vegetation sampling experience, without participation of the university faculty. Again, high school students entered data into the website to allow a comparison of the accuracy with the baseline dataset.

For the third citizen scientist data collection session (fall 2009, Table 1), we attempted to reduce errors students had demonstrated in earlier sessions related to deciding whether to include or exclude trees that were located along the perimeter of the permanent plot by adding numbered tree tags to all trees within the plots. We also provided each of the adult leaders with an answer key for reference while collecting data with the students. University faculty, graduate students and high school teachers led the data collection for this third session. After collection, high school students entered their data into the website for comparison with the baseline dataset.

For our fourth citizen scientist session in the fall of 2010, we attempted to decrease the age gap between instructors and high school students by having undergraduates from Virginia Tech teach high school students from Locust Grove High School in Georgia at Indian Springs State Park (Table 1). Again, high school students entered their data into the website to allow us to compare the accuracy of their data to the answer key.

For the fifth citizen scientist session also in the fall of 2010, the same undergraduates from Virginia Tech who had taught at Indian Springs State Park led high school students from Freedom High School in Virginia at Mason Neck National Wildlife Refuge in the collection of data from the permanent plots. Thus, the undergraduates were provided the opportunity to improve their teaching approach based on their earlier experience in Georgia. High school students again entered their data into the website for accuracy assessment.

For the sixth citizen scientist session, Virginia Tech and University of Georgia undergraduates team-taught Georgia high school students from Locust Grove High School at Indian Springs State Park (fall 2011, Table 1). The Virginia Tech and University of Georgia undergraduates had worked together to improve their team-teaching skills and leadership skills at a weekend workshop prior to the teaching day. After data collection, high school students returned to their classrooms to enter their data into the website.

The seventh and final citizen scientist session was team-taught by a different group of undergraduates from Virginia Tech and the University of Georgia and had Virginia high school students from Patriot High School sampling the permanent plots at Mason Neck National Wildlife Refuge in the fall of 2011 (Table 1). This group of Virginia Tech and University of Georgia undergraduate students has also participated in the weekend teaching and leadership workshop. Again, high school students entered their collected data on the website.

Data analysis

Accuracy of Tree Diameter (DBH) Data

We examined the accuracy of student collected tree diameter data by comparing student measurements to an answer key established by trained university faculty at each location. Accuracy was then defined in two ways: (1) by determining if student collected DBH data were within +/- 0.25 cm (1/10 inch) of the answer key - the standard used by the U.S. Forest Service in their Forest Inventory and Analysis program (Woudenberg et al., 2010) and (2) by determining if student collected DBH data were within +/- 0.75 cm (3/10 inch) of the answer key (a standard created by the researchers). Accuracy values were compared across the seven teaching sessions, by student type (environmental/earth science high school students vs. agricultural education high school students) and by instructor type (university faculty, high school teachers, or undergraduate students). Frequencies and percentages were used to summarize the data by reporting how often DBH measurements collected by high school students matched the answer key within +/- 0.25 cm (U.S. Forest Service Standard) and within +/- 0.75 cm (Researcher Standard).

Accuracy of Tree Species Data

During all citizen scientist sessions, high school students identified tree species within sampling plots using a site specific dichotomous key that included photographs of buds, leaves and bark. Accuracy of student identification of tree species was examined by comparing student responses to tree species data on a site specific answer key established by trained university faculty at each location. We coded student responses as correct, incorrect, or semi-correct. Semi-correct answers were tagged when the students identified the correct genus, but incorrectly identified the species e.g., a red maple (*Acer rubrum*) identified as a sugar maple (*Acer saccharum*). Accuracy values were again compared across the seven teaching sessions, by student type and by instructor type. Frequencies and percentages were used to summarize the data by reporting how often high school students identified tree species within a plot as correctly, semi-correctly, or incorrectly.

Results

Accuracy of Tree Diameter (DBH) Data

Regardless of the standard for tree diameter comparison, students were most accurate when instructed by trained university faculty (session 1, see Table 2). Data tended to be less accurate when students were instructed by graduate students or undergraduate students (sessions 3-7). At Mason Neck National Wildlife Refuge, tree diameter data were less accurate when collected by students who were instructed by their high school science teachers when compared to university faculty and more accurate when compared to undergraduate students. However, teachers had been trained on appropriate field data collection techniques prior to assisting their students with data collection. At Indian Springs State Park, tree diameter data were most accurate when collected by high school students who were instructed by teams of undergraduate students comprised of forestry students (Virginia Tech) and agricultural communications students (University of Georgia, Table 2). However, tree diameter data were least accurate when collected by high school students who were instructed solely by forestry undergraduate students.

We compared the accuracy of the tree diameter data across the types of high school classes that collected the data. High school students from agricultural education classes collected data that was very similar in accuracy to data collected by students from environmental/earth science classes (Table 3). There were a total of two sessions that included agricultural education classes (all from Indian Springs State Park) and five sessions of environmental/earth science classes (all from Mason Neck National Wildlife Refuge); therefore, the averages represent different numbers of sessions.

Accuracy of Tree Species Data

The ability of high school students to accurately identify tree species within fixed plots was also examined across data collection sessions. We summarized accuracy of tree species data into three categories: correctly identified trees, incorrectly identified trees and semi-correctly identified trees. On average, high school students collecting data at Mason Neck National Wildlife Refuge were accurate (completely correct) with tree identification 97% of the time, regardless of the teaching session (Table 4). However, high school students collecting data at Indian Springs State Park were, on average, accurate with tree identification 80% of the time. A higher proportion of trees were identified incorrectly or semi-cor-

Table 2. Accuracy of tree diameter data collected by high school students from Virginia and Georgia during seven citizen scientist experiences held between 2008 and 2011. Details of the format for each session are provided in Table 1.

Teaching Session	Accuracy Compared to Forest Service Standard (+- 0.25cm)	Accuracy Compared to Researcher Standard (+-0.75cm)
1	83.6%	96.4%
2	81.3%	81.3%
3[z]	28.1%	75.0%
4[z]	44.0%	78.7%
5[z]	19.5%	65.5%
6[z]	78.7%	81.3%
7[z]	32.0%	72.0%

[z] Numbered tree tags placed at breast height on all trees within permanent sampling plot and group leaders were provided answer keys.

Table 3. Accuracy of tree diameter data measured by high school students from Virginia and Georgia during citizen scientist sessions held between 2008 and 2011 based on the type of high school class. Details of the format for each session are provided in Table 1.

Type of High School Class	Accuracy Compared to Forest Service Standard (+-.25cm)	Accuracy Compared to Researcher Standard (+-.75cm)
Environmental/Earth Science	38.6%	76.2%
Agriculture	40.7%	79.1%

Table 4. Accuracy of tree species data collected by high school students from Virginia and Georgia during seven citizen scientist teaching sessions from 2008 to 2011. Semi-correct values represent a correct identification of the genus but an incorrect identification of the species.

Teaching Session[x]	Completely Correct	Semi-correct	Incorrect
MNNWR[y]			
1	95.9%	3.1%	1.0%
2	93.3%	6.7%	0%
3[z]	97.6%	1.6%	0.8%
5[z]	99.0%	0%	1.0%
7[z]	100%	0%	0%
Average	97.2%	2.3%	0.6%
ISSP[y]			
4[z]	84.2%	14.5%	1.3%
6[z]	75.0%	12.5%	12.5%
Average	79.6%	13.5%	6.9%

[x] Details on the format of each session are provided in Table 1.

[y] MNNWR - Mason Neck National Wildlife Refuge and ISSP - Indian Springs State Park.

[z] Numbered tree tags placed at breast height on all trees within permanent sampling plot and group leaders were provided answer keys.

Table 5. Amount of error in data collected by high school students from Virginia and Georgia during seven citizen scientists experiences held from 2008 to 2011. Details of the format for each session are provided in Table 1.

Teaching Session	Number of Errors	Number of Trees in Plots	Percent Error
Student data collected before tree tags installed	97	102	95%
Student data collected after tree tags installed	14	241	6%

rectly at Indian Springs State Park than at Mason Neck National Wildlife Refuge (Table 4).

Influence of Tree Tags on Data Accuracy

For the first two data collection sessions (Table 1), high school students were provided with a plot center, but had to measure the 8 m radius of the circular plots with a tape measure and determine which trees were "in" or "out" of the plot boundaries. The error rate on either excluding trees they should have included or including trees they should have excluded was very high (95% error rate). This high error rate prompted us to attempt to reduce this error, so we nailed numbered, metal tree tags at breast height on all trees that should be included within each plot. Students in the subsequent data collection sessions averaged only a 6% error rate and made substantially fewer inclusion/exclusion mistakes (Table 5). In contrast to the improvement in inclusion/exclusion mistakes, the accuracy of the DBH measurements declined after the addition of tree tags (Table 2). This decline in accuracy may be due to other factors, such as adult leaders in subsequent data collections sessions (undergraduate students) having less experience than either university faculty or trained science teachers.

Discussion

Accuracy of Tree Diameter Data Collected by Agriculture vs. Environmental Science Students

Students who enroll in agriculture classes as part of their high school curriculum benefit from this experience through higher scores on standardized science tests, more supportive attitudes towards agriculture and lower drop-out rates (Bishop, 1989; Dyer et al., 1996; Chiasson and Burnett, 2001). However, students enrolled in agriculture classes (79% accuracy on diameter measurements) did not collect substantially more accurate data compared to their counterparts who were enrolled in environmental/earth science classes, but had not taken agriculture classes during their high school program (76% accuracy on diameter measurements, Table 3). The benefits of the additional agriculture classes may not appear as an improvement in data accuracy because the high school students from Sessions 1-3 were enrolled in an elective environmental science class and therefore chose to be in that course. The benefits garnered for students from taking additional science classes have been well documented (Levine and Zimmerman, 1995). The least accurate diameter data were collected during Sessions 5 and 7 by high school citizen scientists who were enrolled in a mandatory science class (Table 2). Perhaps students who are interested in science and enroll in elective science courses take these field experiences more seriously, record data more accurately and enter their data online more carefully than students in mandatory science courses.

Tree Identification Data Accuracy Across Study Sites

Generally, plant species richness (number of species) increases with closer proximity to the equator and Mason Neck National Wildlife Refuge in northern Virginia (species richness 12) and Indian Springs State Park in central Georgia (species richness = 16) followed this pattern. At Mason Neck National Wildlife Refuge students achieved 97% accuracy in their tree identification (Table 4), while at the more diverse Indian Springs State Park high school students were only able to identify 80% of the trees correctly (Table 4). Another challenge for the students at Indian Springs State Park and one that resulted in a high number of semi-correct tree identifications (correct genus, but wrong species identification), was the high number of oak (*Quercus*) species present. Mason Neck National Wildlife Refuge had two oak species: white oak (Quercus alba) and southern red oak (*Quercus falcata*). In contrast, Indian Springs State Park had six oak species: white oak, southern red oak, water oak (*Quercus nigra*), northern red oak (*Quercus rubra*), post oak (*Quercus stellata*) and black oak (*Quercus velutina*). Identifying plants to the species level is more challenging than identifying plants to the genus level. Among professional plant scientists, 75% of mistakes in plant identification accurately identified the genus, but misidentified species (Luczaj, 2010). Thus, based on the results from this study (Table 4), citizen scientist programs based in regions with high

biodiversity are likely to have more errors in species identifications than regions with lower biodiversity. This issue is of particular concern for high-diversity tropical regions that rely upon citizen scientists to collect data and monitor ecosystem changes. Invasive species citizen scientist programs have addressed this challenge by having volunteers collect data for a single taxon (Crall et al., 2010), a practice that greatly reduces training time for new citizen scientists.

Influence of the Scientific Background of the Adult Instructor

Introductory training for citizen scientists is important in any citizen scientist program. Most programs provide interactive training sessions led by professional researchers, where citizen scientists practice new skills for data collection. After training, citizen scientists collect data independently (Gardiner et al., 2012; Gollan et al., 2012). The seven citizen scientist sessions in this study involved high school students rather than adults; therefore, the students collected data under the supervision of an adult citizen scientist instructor (Table 1). The educational background of the instructor varied across the sessions, thus, providing an interesting comparison of how their education level influenced the accuracy of citizen scientist data collection. The high school students collected the most accurate data when they worked in teams coordinated by university faculty (session 1, 96% accuracy on diameter measurements, Table 2) and the least accurate data were collected when high school students were instructed by undergraduate students (sessions 4-5 and 7, 75% accuracy on diameter measurements, Table 2). However, our intention in placing undergraduates in the position of team instructors was to increase high school student's career awareness of natural resources and agriculture by providing them with a role model who was closer to their own age and thus more likely to share common interests (Schmidt et al., 2004). In fact, at Indian Springs State Park, the most accurate data were collected by high student students instructed by teams of forestry and agricultural communications undergraduate students (Table 2). The skill sets of the two majors seem to complement each other, with forestry undergraduates bringing content knowledge and agricultural communication undergraduates bringing the teaching methods expertise. Given the success of citizen scientist programs at providing urban high school students with an opportunity to visualize themselves in a career pathway with which they otherwise would have had no exposure (Bombaugh, 2000), lower accuracy may be an acceptable trade-off in disciplines where recruiting students is a challenge.

Recommendations for Future Citizen Scientist Programs

This study indicates four main approaches to improve the accuracy of scientific data collected by citizen scientist programs. First, citizen scientists should be trained by experienced researchers. Second, when planning the infrastructure for repeat measurements provide on-site demarcations to indicate what should be sampled by the citizen scientists, e.g., for forest sampling use permanent plot centers, tree tags and mark the level of breast height on all trees. Third, when possible, limit citizen scientist programs to regions with lower biodiversity. If the region of interest is an area of high natural biodiversity, limit citizen scientist measurements to a single species. Finally, for volunteer-based citizen scientist programs, recruit individuals who have taken agricultural or science classes as part of their high school education.

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Instruments for Characterizing Instructors' Teaching Practices: A Review

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Abstract

Recent trends in higher education such as distance education and student-centered learning have challenged instructors to evaluate and reevaluate their teaching practices and philosophies. Several instruments have been developed to help instructors describe their teaching philosophies and improve their instructional effectiveness through self-reflection, however these instruments are seldom mentioned or reported in the literature. These include the Approaches to Teaching Inventory, Teaching Perspectives Inventory, Teaching Goals Inventory and Teaching Styles Inventories. The aim of this review is to summarize what information these inventories provide teachers.

Introduction

There are a number of trends and considerations that confront instructors in higher education. For example, many instructors have replaced the traditional lecture format with flipped teaching, by providing students with short videos to watch at the beginning of lecture and then facilitating classroom activities such as discussion and group projects. Other trends include the increase in popularity of distance education and student-centered learning. Amidst these happenings and considerations, a discussion that encourages personal reflection on teaching characteristics would be helpful for instructors working to establish their teaching identities within the context of established frameworks.

Attempts have been made to characterize students' individual learning styles (Romanelli et al., 2009). For example, David Kolb's model is based on experiential learning theory and categorizes the way a person prefers to acquire and process information according to whether they are a converger, diverger, assimilator or accommodator (Kolb, 1994). Also commonly used, Neil Fleming's learning model categorizes whether learners prefer to acquire new information by visual, auditory or tactile observations (Fleming and Mills, 1992). The model developed by Felder and Silverman is also popular, as it characterizes how students perceive information, what forms of information they prefer, how they organize information and how they progress in understanding information (Felder and Brent, 2005).

On the other hand, frameworks that recognize differences in instructors' teaching characteristics are scarcely mentioned. Similar to students and teachers who identify their learning styles and accordingly adopt strategies to enhance their studying effectiveness, instructors interested in improving their teaching skills could benefit from identifying their teaching characteristics. Just as there are a variety of questionnaires and models used for identifying students' learning characteristics, a variety of instruments have been developed for characterizing instructors' teaching practices. This topic is an active area of scholarship, though it has been studied less than students' learning styles (Meyer and Eley, 2006).

The objectives of this manuscript are to review some instruments for characterizing teaching practices and discuss their usefulness for instructors wanting to craft their teaching philosophy and hone their teaching skills.

The questions addressed in this paper are:

1. What instruments have been developed for teachers to improve their instructional effectiveness and what information do these inventories provide teachers?
2. What are some key findings of studies reported in the literature that involve these instruments?

Instruments for Characterizing Teaching Practices

Approaches to Teaching Inventory: Identifying Student- vs. Teacher-Centered Instructors

The Approaches to Teaching Inventory (ATI) model was originally developed while studying the relationship between students' and teachers' approaches to learning (Trigwell and Prosser, 2004; Prosser and Trigwell, 2006). This model suggests that instructors' intentions of lecturing range from transmitting information with the expectation that students will understand and grasp important concepts on their own to deliberately working with students to facilitate their confrontation of the concepts. The ATI organizes such teaching intentions and strategies into five categories as illustrated in

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Table 1. The process for identifying and categorizing instructors' teaching strategies and intentions originally entailed qualitative interviews and has evolved into a simple questionnaire for instructors to complete (Trigwell and Prosser, 2004).

Table 1. Five approaches to teaching categorized according to intentions and strategies in teaching (adapted from Prosser and Trigwell, 2006). This spectrum of intentions of teaching ranging from information transmission to conceptual change is exercised by teaching strategies ranging from teacher-focused to student-focused, respectively.

	Strategy (Act)		
Intention	Teacher-Focused	Student/Teacher Interaction	Student-Focused
Information transmission	Approach A		
Concept acquisition	Approach B	Approach C	
Concept development			Approach D
Conceptual change			Approach E

The ATI is useful for instructors deciding when, where and how they expect their students to accomplish particular learning outcomes, as it helps with the decision between employing a traditional lecture format or active learning techniques during the class period. In a traditional lecture, the instructor dominates the majority of the lecture time by disseminating a predetermined amount of subject matter, as depicted by Approaches A and B (Table 1). Students taught in this format are held responsible for identifying and mastering important concepts on their own time, while completing homework assignments, projects, laboratory activities and studying for exams outside of class. The deepest learning occurs in the absence of the instructor.

Teacher-centered approaches can be effective and justified, depending on the instructors' objectives. Bligh (2000), McKeachie (2002) and Nilson (2010) suggested several such examples:

1. Modeling approaches to problem-solving or higher-order thinking skills for students prior to expecting them to do the same.
2. Providing quick background knowledge that is not summarized in print.
3. Adapting sophisticated knowledge to students' level and needs in a way that no other available source does.
4. Presenting a particular organization of material that clarifies the structure of the reading, the course or the field.
5. Adding personal viewpoints on the material or related research.
6. Updating students with the very latest material, especially if it is not yet available in a source targeted to the students' level
7. Piquing students' curiosity and motivation if the instructor's style is very expressive.

Currently there is a trend toward student-centered teaching approaches in higher education (Stamm, 2011; Wright, 2011). In this approach, for example, instructors provide some sort of learning module such as a video lesson and/or reading assignment that summarizes the main learning objectives and subject matter for students to complete prior to or at the beginning of the class period and thereby free up the majority of the class period for interacting with students and facilitating learning activities instead of lecturing. The intentions of these lecture activities are to engage students' mastery of important concepts, thus flipped teaching is characterized by Approaches D and E (Table 1).

Replacing a teacher-centered with a student-centered teaching approach can be a worthwhile investment. Instructors adoptions of student-centered learning have been shown to result in deeper student learning (Trigwell and Prosser, 2004). This can provide personal satisfaction for the instructor, as he/she spends more time interacting with and mentoring students as they grasp key concepts. In addition, instructors' emotions while teaching have been shown to be more positive while using a student-focused approach than a teacher-focused approach (Trigwell, 2012). However, becoming proficient in student-centered teaching requires practice and experience with facilitating active learning sessions and this could be a new skill for many instructors. Some of the most effective active learning exercises such as service-learning have been shown to be used the least by instructors striving to create a student-centered classroom (Webber and Tschepikow, 2011).

Attempts have been made to characterize approaches to teaching according to instructor factors. Empirical evidence has been used to suggest that instructors who understand how the subject matters they teach relates to the concepts, issues and theories within their fields of study often take student-centered approaches to teaching (Prosser et al., 2008). Also, instructors who continuously re-interpret and question their subject matter are more likely to adopt a student-centered approach to teaching, as compared to those who do not experience change in the understanding of their subject matter (Trigwell et al., 2005). Gender has been suggested to play a role in instructors' approaches to teaching, as male faculty members have been reported to adopt teaching strategies that are more teacher-centered (Singer, 1996; Lacey and Saleh, 1998). Specifically, female instructors in higher education have been reported to spend more class time on active learning exercises, as opposed to lecturing, than males (Laird et al., 2011).

Several studies have also sought to characterize approaches to teaching according to a variety of institutional factors. For example, empirical data has been used to demonstrate how instructors' approaches to teaching depend on their perceptions of the degrees to which administrators' and colleagues' are committed to learning and teaching (Ramsden et al., 2007). Also, participation in faculty development programs has been associated with junior faculty members shifting their approaches to teaching towards a student-focused teaching approach (Light et al., 2009), thus continuing education on facilitating active learning classroom

environments increases the effectiveness of instructors wishing to create student-centered courses. There are conflicting reports on whether approaches to teaching vary according to the discipline being taught. For example, while the ATI has been used to demonstrate that instructors in "hard disciplines" such as chemistry and medicine tend to use teacher-centered approaches, whereas student-centered approaches are more commonly used in "soft disciplines" such as history and education (Lindblom-Ylanne et al., 2006; Lueddeke, 2003), other studies have reported no differences between disciplines (Stes et al., 2008).

Teaching Perspectives Inventory: Identifying the Beliefs, Intentions and Actions of Instructors

The Teaching Perspectives Inventory (TPI) categorizes instructors' perspectives on teaching as transmission, apprenticeships, developmental, nurturing, or social reform, as defined below (Pratt, 1998; Collins and Pratt, 2011):

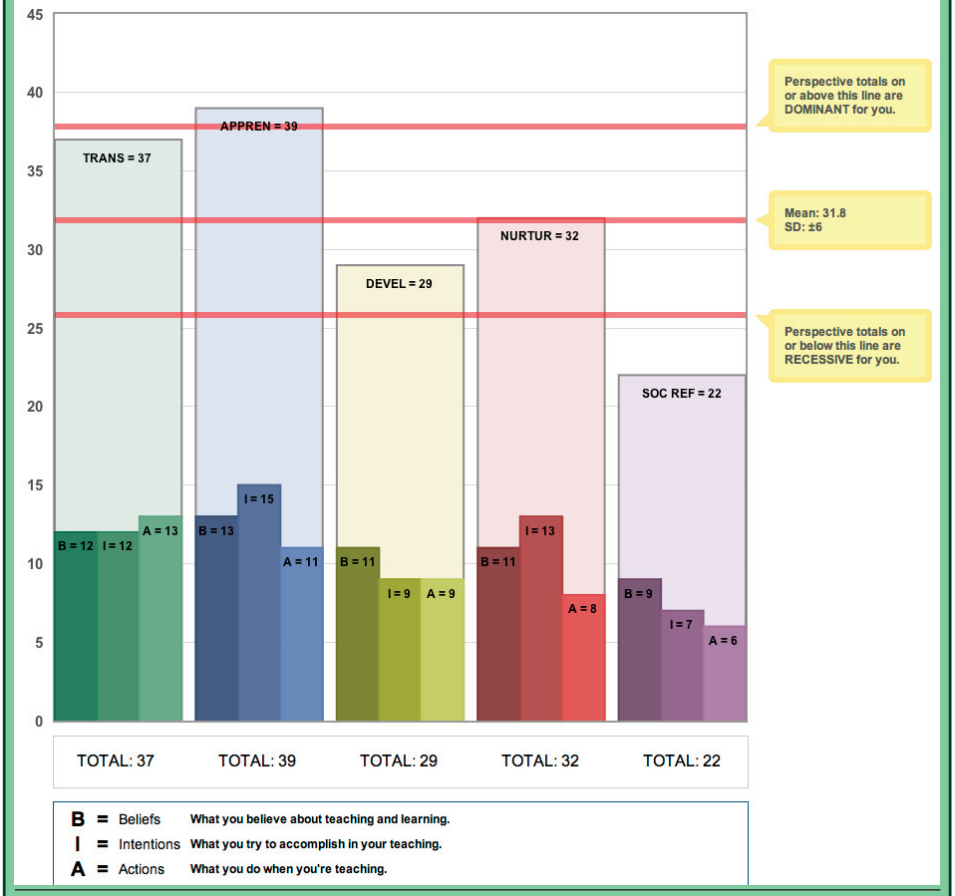
1. Transmission: "Effective teaching requires a substantial commitment to the content or subject matter"
2. Apprenticeship: "Effective teaching is a process of teaching students a particular cultural set of social norms and ways of working"
3. Developmental: "Effective teaching must be planned and conducted "from the learner's point of view"
4. Nurturing: "Effective teaching assumes that long-term, hard, persistent effort to achieve comes from the heart, as well as the head"
5. Social reform: "Effective teaching seeks to change society in substantive ways"

In the TPI model instructors are asked questions that are used to rank their actions, intentions and beliefs about teaching. A 5-point frequency scale ranging from "never" to "always" is used to score what instructors do and try to accomplish while teaching and a 5-point scale ranging from "strongly agree" to "strongly disagree" is used to score what instructors believe about teaching. After completing the TPI survey, a report is generated that characterizes instructors' recessive and dominant perspectives, as well the scores of their actions, intentions and beliefs about each perspective. This survey is available for free at http://www.teachingperspectives.com (Collins and Pratt, 2013).

The TPI is a useful tool for instructors interested in identifying their perspective and taking this a step further to evaluate whether their actions in teaching are aligned with their beliefs and intentions. For example, Figure 1 illustrates an instructor whose dominant beliefs and intentions about teaching reflect the Apprenticeship perspective, but the actions that this instructor practices are more in line with the Transmission perspective. For this instructor to embrace their dominant perspective, they could consider adopting more teaching activities that focus students on learning how to work in a cultural set of norms (Apprenticeship activities) to solve problems and fewer activities focused on acquiring and understanding concepts and content (Transmission activities).

The TPI has not been studied to the same extent as the ATI, though it has been shown to be useful during peer reviews of teaching. Peer reviews of teaching tend to be lower when the instructor being reviewed holds a different perspective than the peer reviewer (Courneya et al., 2008).

Figure 1.



Example of the author's teaching perspectives as determined by completing the Teaching Perspectives Inventory (Collins and Pratt, 2011). The primary teaching perspective in this case is Apprenticeship. Apparently, the instructors' Intentions (score = 15) to create an Apprenticeship teaching experience by instilling a particular cultural set of social norms and ways of working are greater than his Beliefs (score = 13) and Actions (score = 11). This presents opportunity for personal reflection on teaching practices.

Retrieved online at http://www.teachingperspectives.com

Teaching Goals Inventory: Linking Instructor Goals to Assessment Activities Used

The Teaching Goals Inventory (TGI) was developed to help instructors align their classroom assessment techniques with the goals they have for their students (Angelo and Cross, 1993). This inventory is produced after instructors complete a 52-question survey, ranking how important they believe certain student accomplishments are on a 5-point scale ranging from "essential" to "unimportant" or "not applicable." The last question of this survey asks the instructor to choose one of six statements that best describes what their primary role as a teaching professor is.

A report is generated that categorizes the instructor's responses into seven clusters, according to which of the following goals the instructor deemed to be essential (Table 2).

1. Higher order thinking skills
2. Basic academic success skills
3. Discipline-specific knowledge and skills
4. Liberal arts and academic values
5. Work and career preparation
6. Personal development

This questionnaire is available over the Internet: http://fm.iowa.uiowa.edu/fmi/xsl/tgi/data_entry.xsl?-db=tgi_data&-lay=Layout01&-view (Angelo and Cross, 2013).

The TGI is useful for describing the anticipated learning outcomes and objectives of lessons and courses. After completing this inventory, instructors are given a report that distinguishes which teaching goals they rated essential, very important, important, unimportant and not important. Identifying and recognizing the goals of a lesson or course in this manner allows an instructor to find the appropriate learning activities to complement those goals. For example, the instructor whose TGI is illustrated in Table 2 should consider activities that mostly facilitate higher order thinking skills and some work and career preparation. The book Classroom Assessment Techniques (Angelo and Cross, 1993) provides 50 activities for instructors to consider facilitating in their classrooms and specifies which of these activities accomplish the various six goals in the TGI.

The TGI has not been studied as much as the ATI, however it has been the subject of some studies relating faculty cultures with teaching goals. Faculty who view themselves as student-centered emphasize the importance of Higher Order Thinking Skills, Liberal Arts and Academic Values, Work and Career Preparation and Personal Development more than instructors who adopt teacher-centered approaches (Fox, 1997). These same goals are more common amongst instructors in academic cultures with low barriers to their exchange of ideas about their teaching goals than those in other cultures. Fox (1997) also demonstrated that the more experienced faculty members become, the less they emphasize Higher Order Thinking Skills and Work and Career Preparation. Faculty teaching web-based classes have been shown to have a higher preference for Higher Order Thinking Skills, perhaps because teaching online forces faculty to reflect on learning activities more than teaching face-to-face courses (Hardy, 2002). These examples of differences in teaching goals illustrate the usefulness of the TGI for faculty engaging in conversations about the goals of their academic programs.

Table 2. Example of the author's teaching goals as determined by completing the Teaching Goals Inventory (Angelo and Cross, 1993). The TGI in this case was useful to the instructor in identifying his primary objective was for students to accomplish Higher Order Thinking Skills, as he rated 100% of the goals in this cluster as "Essential." In contrast, the least important objective to this instructor was the Personal Development cluster. None of the goals in this cluster received an "Essential" rating and the mean rating of this cluster was a 1.00 on a five-point scale.

Cluster	Goals Included in Cluster	Percent Rated "Essential"	Mean Rating
1. Higher Order Thinking Skills	1-8	100%	5.00
2. Basic Academic Success Skills	9-17	11%	2.67
3. Discipline-Specific Knowledge and Skills	18-25	0%	2.63
4. Liberal Arts and Academic Values	26-35	0%	1.2
5. Work and Career Preparation	36-43	13%	2.88
6. Personal Development	44-52	0%	1.00

Teaching Style Inventories: Three Instruments for Identifying How Instructors Teach

Similar to the TPI, the Grasha-Riechmann Teaching Style Inventory (TSI) is a useful resource for instructors interested in identifying their preferred instruction style (Grasha, 1996). This 40-question survey asks instructors to provide responses to statements about how they teach, e.g. "students typically work on course projects alone with little supervision from me" and "students would describe my standards and expectations as somewhat strict or rigid" on a 5-point scale ranging from "strongly agree" to "strongly disagree." These responses are then used to generate scores for matching how much the instructor's style lines up with five different teaching styles:

1. Expert: the instructor possesses the knowledge and expertise that students need to acquire
2. Formal authority: the students acknowledge the instructor's status because of his/her knowledge and role as a faculty member
3. Personal model: the instructor strives to teach by personal example
4. Facilitator: the instructor emphasizes teacher-student interactions and guides students by guiding them towards independent learning
5. Delegator: the instructor delegates the learning process to students in a manner that gives students the autonomy to learn on their own terms

The original publication describes advantages and disadvantages of each teaching style. Grasha (1996) proposed an integrated approach that connects particular teaching styles with learning activities according to the learning style preferences of students.

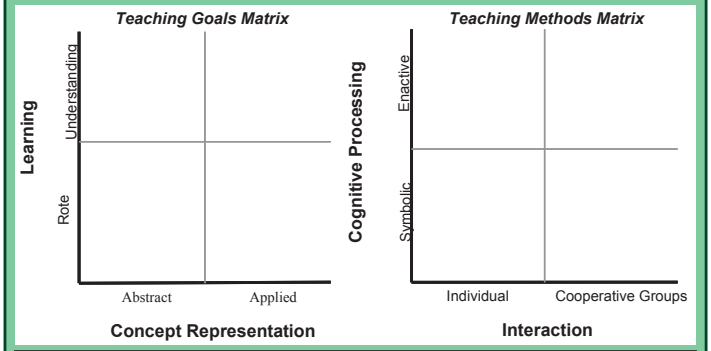
Another method for identifying teaching styles is the Staffordshire

Evaluation of Teaching Styles (Mohanna et al., 2008). This inventory is different from the Grasha-Riechmann TSI, as it characterizes what instructors prefer to do with their class time. It consists of 24 questions that ask to what extent instructors like to employ various teaching techniques. These responses are used to characterize instructors' preferred teaching styles according to the following categories (Figure 2):

1. The all-around flexible and adaptive teacher: "can use many different skills, can teach both peers and juniors and is very aware of the whole environment both of teaching and of the learners."
2. The sensitive and student-centered teacher "is very learner-centered, teaches in small groups, with emotions to the fore, using role-play and drama and is not comfortable doing straight presentations."
3. The official formal curriculum teacher: "is very well prepared, accredited, is very aware of and adheres to the formal curriculum and follows external targets."
4. The straight facts no nonsense teacher: "likes to teach the clear facts, with straight talking, concentrating on specific skills and much prefers not to be involved with multiprofessional teaching and learning."
5. The big conference teacher: "likes nothing better than to stand up in front of a big audience and does not like sitting in groups or one to one teaching."
6. The one-off teacher: "likes to deliver small self-contained bits of teaching on a one to one basis, with no props to help and no follow up."

The Center for Occupational Research and Development (CORD) Teaching Styles Inventory considers teaching approaches and teaching goals CORD (2005) and is available over the Internet (http://www.texascollaborative.org/tools/TSI.pdf). This 12-question inventory is used to characterize instructors' teaching goals according to what extent they believe the learning process should be rote vs. focused on developing understanding whether concepts are abstract vs. applied. It also characterizes instructors' teaching methods according to whether their students' cognitive processing is described as symbolic or enactive and whether classroom interactions are described as individual vs. cooperative groups (Figure 3).

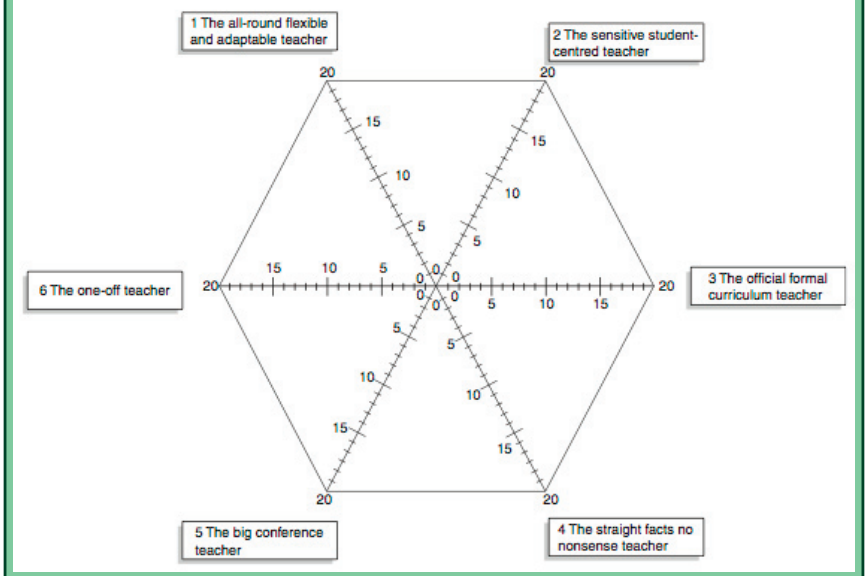
Figure 3.



Graphical representations of the learning styles as described by the CORD Teaching Styles Inventory. Teaching styles depend on the teaching goals (left), which vary according to spectrums of how concepts are represented (from abstract to applied) and the level of learning (from rote to understanding). Also teaching styles depend on teaching methods (right), in which the spectrums include interaction (from individual to cooperative groups) and cognitive processing (from symbolic to enactive). Adopted from CORD (2005).

These inventories for characterizing teaching styles have scarcely been studied and reported in the literature. Further, research on whether the act of catering a teaching style to students learning styles results in increased student success has been inconclusive (Dincol et al., 2011).

Figure 2.



Radar chart for plotting instructors' teachings styles according to the Staffordshire Evaluation of Teaching Styles. Adopted from Mohanna et al. (2008).

Summary

This article sought to describe some instruments that describe the various characteristics of instructors within the contexts of established models. The instruments that were discussed included the Approaches to Teaching Inventory, Teaching Perspectives Inventory, Teaching Goals Inventory and three different inventories for characterizing teaching styles (Table 3). Each of these instruments consist of a series of questions for instructors to answer, the results of which are used to classify the instructors' teaching characteristics into various categories. As implied in the various names of these instruments, the types of information they provide instructors differ. However, commonalities exist in the how these instruments characterize the ways instructors approach the teaching process, aim to accomplish various goals while teaching and reflect on their roles as instructors.

These instruments hold value for both instructors and programs interested in

Table 3. Summary of instruments useful for characterizing teaching practices.

Inventory	Authors	Usefulness	Inventory Availability
Approaches to Teaching Inventory	Trigwell and Prosser	Identifies instructors' approaches to teaching in terms of where on the student- vs. teacher-centered and conceptual change vs. information transmission continua they lay. Useful for reflection on instructional design considerations.	No website. Available in the manuscript (Trigwell and Prosser, 2004) book (Trigwell and Prosser, 1999)
Teaching Perspectives Inventory	Pratt and Collins	Categorizes instructors' overall perspectives on teaching as transmission, apprenticeship, developmental, nurturing, or social reform. Provides scores for determining whether instructors' beliefs and intentions while teaching actually match their actions.	Website: http://www.teachingpersectives.com Also available in book (Pratt, 1998)
Teaching Goals Inventory	Angelo and Cross	Categorizes instructors' teaching goals as higher order thinking skills, basic academic success skills, discipline-specific knowledge and skills, liberal arts and academic values, work and career preparation, and/or personal development. The authors' book suggests customized classroom assessment techniques for achieving these goals.	Website: http://www.centeach.uiowa.edu/tools Also available in book (Angelo and Cross, 1993)
Staffordshire Evaluation of Teaching Styles	Mohanna, Chambers and Wall	Characterizes an instructor's teaching style as all around flexible and adaptive, sensitive and student-centered, official formal curriculum, straight facts no nonsense, big conference, or one-off teacher.	http://longleaf.net/teachingstyle.html Also available in book (Grasha, 1996)
Grasha-Riechmann Teaching Style Inventory	Grasha-Riechmann	Characterizes the instructor's teaching style as expert, formal authority, personal model, facilitator or delegator. Useful for reflection on teacher-student relationships and also peer review of teaching.	No website. Available in book (Mohanna, Chambers and Wall, 2008)
Cord Teaching Styles Inventory	Center for Occupational Research and Development	Categorizes instructors' teaching goals in terms of where on the rote vs. understanding and abstract vs. applied continua they lay. Also characterizes the instructors' teaching methods based on where on the enactive vs. symbolic and individual vs. cooperative groups continua they lay.	Website: http://www.cord.org/teaching-styles-inventory

improving their teaching effectiveness. Instructors are encouraged to incorporate these instruments into their reflections on teaching and teaching portfolios. These instruments may also be useful for peer reviews of teaching. The various distinguishing characteristics within any one of the inventories reported in this manuscript may be acceptable and effective, depending on the instructor in consideration and the context of what they are teaching. The instruments in this manuscript provide a framework for guiding discussions about the characteristics of individual instructors, as well as the differences and similarities amongst instructors, within a particular program or department.

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Professional Development Needs of Instructors of Online Swine Science Courses[1]

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Abstract

This mixed-methods study sought to identify specific professional development needs of instructors relative to teaching, advising and recruiting students in two online programs: Swine Science Online and Professional Swine Manager. The study consisted of interviews with eight instructors and a survey of all 25 instructors in the programs. These instructors have intermediate- to novice-level self-perceived proficiency with course management systems and varying levels of self-perceived proficiency with other online education tools. They want to learn strategies and techniques to increase students' interaction in online courses but see time as a significant barrier to professional development and to improving online instruction. As a result of this study, we recommended the United States Pork Center of Excellence conduct a professional development workshop with sessions on time management related to online education, promoting student interaction in online courses and using successful, research-based strategies for online education.

Introduction

Enrollment at U.S. colleges and universities increased by 11% from 1990–2000 and by 37% from 2000–2010 (U.S. Department of Education, National Center for Education Statistics, 2012). To accommodate increased enrollments and make education more accessible, colleges and universities are delivering more courses and programs online. In the fall of 2010, 31% of undergraduate students in the United States were enrolled in at least one distance education course (Sloan Consortium, 2013). This amounts to more than six million students (Sloan Consortium, 2013). Nearly 80% of public institutions and 70% of private, nonprofit institutions believe online education is critical to their long-term academic strategy (Sloan Consortium, 2013).

Students, instructors and institutions see several advantages to distance education over traditional education. Students who are normally shy in a traditional classroom benefit by having adequate time to think about what they want to say before posting comments or discussions online (Smith et al., 2001). Students also benefit from a more flexible schedule, the convenience of taking classes at home, increased access for nontraditional students and the possibility of more individualized attention depending on the class size (Matthews, 1999). Students and instructors may benefit by having more discussion with each other because the instructor is seen as less of an authoritarian figure and more of an equal (Smith et al., 2001). This can be good for students who may feel intimidated by professors but can also make it more difficult for instructors to give help if students become frustrated. Institutional advantages include increased enrollment, less maintenance of campus buildings and a public perception that the institution is forward thinking (Matthews, 1999).

There are also some problems related to distance education. Smith et al. (2001) note that it can take hundreds of hours for initial setup of a distance education course. Everything must be detailed and have clear directions. Students are not able to ask immediate questions as they might in a traditional classroom. In addition to developing the course, instructors must still grade assignments, respond to questions and have discussions with students (Smith et al., 2001).

Hall (1996) suggests that, as a general rule, instructors should be trained for distance education. For training to be effective, the trainers need to know what the instructors already know and also what they want to learn. The best way to find out this information is to conduct a needs assessment.

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A needs assessment is "any systematic procedure for setting priorities and making decisions about the allocation of educational resources" (Witkin, 1984, p. 35). When conducting needs assessments, assessors should be "attuned to the stakeholders" (Royse et al., 2009, p. 24). The stakeholders are the people affected by the problem. In needs assessments related to education and teaching, instructors are often the stakeholders.

Brown (2002) suggests working through three steps when conducting needs assessments. The first step is to gather data. There are a variety of ways to do this. Assessors can make observations or conduct interviews, surveys, panels, or focus groups. Then, assessors need to determine what expressed needs can be met through professional development or training. Some expressed needs must be handled through other means. The last step is to make formal recommendations for addressing specific needs.

Several needs assessment studies have focused on professional development for instructors of agricultural subjects. Simerly (1990) determined that many faculty members are interested in professional development focused on communication with students. Murphy and Terry (1998) concluded that many agriculture instructors want to learn better techniques for distance education. However, they also noted that some instructors do not believe distance education is a viable alternative to traditional teaching. Miller and Carr (1997) conducted a needs assessment for agricultural faculty related to distance education. They found the highest rated training need was teaching techniques for distance education. All of these needs assessment studies used similar descriptive survey research methods.

To be most effective, researchers must adapt common needs assessment approaches to the content and context of a particular situation. For this study, we asked two overarching questions: What are the specific needs of instructors of swine science courses delivered via distance education? How do these instructors want to experience professional development related to distance education?

Purpose and Objectives

The purpose of this study was to determine the professional development needs of instructors of online courses in the Swine Science Online (SSO) and Professional Swine Manager (PSM) programs. We had four specific research questions:

1. To what extent do instructors believe they are proficient with the course management systems they are currently using?
2. To what extent do instructors believe they are proficient with the tools they are using in their online courses?
3. Do SSO and PSM instructors see any barriers to improving online teaching techniques that could be overcome through professional development?
4. What specific professional development activities do instructors want and how do they want the activities to be conducted?

Methods

Design

The qualitative aspect of this mixed-methods study was a phenomenological study (Creswell, 2013) focused on the phenomenon of teaching online. Instructors shared their past experiences and current views on online education through one-on-one semi-structured interviews. Each interview lasted up to 40 minutes and was conducted over the telephone (n = 6) or face-to-face (n = 2).

The quantitative aspect of this study was a descriptive survey categorized as a census of intangibles (Ary et al., 2010). Survey questions were based on themes that emerged from the interviews. All (N=25) instructors in the SSO and PSM programs were surveyed.

Subjects

We conducted interviews with a purposeful sample size of eight instructors. Creswell (2013) indicates that between five and 25 subjects is appropriate for a phenomenological study. We chose instructors on the basis of distance education teaching experience (which ranged from no prior experience to more than four years), experience in the SSO and PSM programs and teaching location (four land-grant universities and two community colleges).

For the descriptive survey, the United States Pork Center of Excellence (USPCE) provided a list of all 25 SSO and PSM instructors who were currently teaching or would begin teaching during the next school year. Twenty-one (84%) instructors responded to the survey.

Instruments

We developed an interview protocol following recommendations from Creswell (2012). The protocol involved a series of semi-structured questions that progressed from questions designed to establish rapport to targeted questions and those that required greater thought. Questions were based on suggestions from the USPCE and focused on instructors' experience with distance education, philosophical views on distance education, the current situation for teaching, instructors' level of distance education training, resources available to instructors, barriers to improvement, training desired by instructors and preferred methods of training. Instructors received the interview questions via email a day in advance. Before the interviews, we conducted reflexive bracketing as defined by Gearing (2004). We wrote down our own views on online education to attempt to minimize their effects on the study.

We then used themes that emerged from the interviews to create the survey. Survey questions focused on tools and course management systems, potential barriers to the improvement of online education teaching strategies and views on the type and focus

of professional development activities instructors desired. We designed the questions to avoid misleading, confusing, or embarrassing respondents (Ary et al., 2010). Survey questions used 5-point and 4-point Likert-type scales. Depending on the question, instructors selected their level of agreement or perceived proficiency.

Table 1. Course Management Systems: Instructors' Use and Self-Perceived Proficiency

		Proficiency f (%)			
System	Use f (%)	Novice	Intermediate	Advanced	Expert
Blackboard	11 (52%)	3 (30%)	6 (60%)	1 (10%)	0 (0%)
Moodle	8 (38%)	3 (33%)	5 (56%)	1 (11%)	0 (0%)
Scholar	2 (10%)	2 (50%)	2 (50%)	0 (0%)	0 (0%)
Desire2Learn	1 (5%)	1 (50%)	0 (0%)	1 (50%)	0 (0%)
Soft Chalk	1 (5%)	1 (50%)	0 (0%)	1 (50%)	0 (0%)
eCollege	1 (5%)	2 (100%)	0 (0%)	0 (0%)	0 (0%)
WebStudy	1 (5%)	0 (0%)	1 (100%)	0 (0%)	0 (0%)
Other	3 (14%)	2 (40%)	1 (20%)	1 (20%)	1 (20%)

Note. Not every instructor responded to the question about whether they used a particular course management system and also rated their proficiency with a particular system.

Table 2. Online Tools: Instructors' Use and Self-Perceived Proficiency

		Proficiency f(%)[y]			
Tool	Use f (%)	Novice	Intermediate	Advanced	Expert
Emails	21 (100%)	0 (0%)	7 (35%)	9 (45%)	4 (20%)
Web links	17 (81%)	1 (6%)	8 (50%)	6 (38%)	1 (6%)
Grade reports for students	15 (71%)	2 (13%)	10 (67%)	3 (20%)	0 (0%)
Online discussions	13 (62%)	1 (8%)	9 (69%)	3 (23%)	0 (0%)
Online audio lectures	13 (62%)	3 (23%)	8 (62%)	1 (8%)	1 (8%)
Online exams	13 (62%)	1 (7%)	6 (43%)	6 (43%)	1 (7%)
Course calendar	10 (48%)	1 (10%)	6 (60%)	2 (20%)	1 (10%)
Online video lectures	6 (29%)	3 (38%)	3 (38%)	1 (13%)	1 (13%)
Online labs	3 (14%)	1 (25%)	1 (25%)	0 (0%)	2 (50%)
Online chat	3 (14%)	0 (0%)	2 (50%)	2 (50%)	0 (0%)
Adobe connect	3 (14%)	1 (25%)	2 (50%)	1 (25%)	0 (0%)
WebEx	2 (10%)	0 (0%)	3 (100%)	0 (0%)	0 (0%)
Other	1 (5%)	0 (0%)	2 (100%)	0 (0%)	0 (0%)

Note. Not every instructor responded to the question about whether they used a particular tool and also rated their proficiency with the tool.
[y] Percentages may not sum to 100 because of rounding.

Data Collection

We followed Creswell's (2012) recommendations for determining where and how to conduct the interviews. For example, we located quiet spaces to conduct the interviews, obtained consent from the instructors beforehand and were respectful to the instructors during and after the interview. We also recorded all interviews (telephone and face-to-face) with a digital audio recorder and took notes during the interview to account for instructors' attitudes and tone of voice.

The survey was conducted online using the Qualtrics survey platform. Following Dillman et al.'s (2008) recommendations, we contacted instructors up to four times by email and a fifth time, if needed, by telephone. Email contacts included a link to the questionnaire. Contacts were separated by three to five days. The response rate was 84% (n = 21) and instructors from both programs responded.

Data Analysis

We emailed the transcribed interviews to instructors so they could check them for accuracy and then coded the transcripts to replace any personal identifiers. Codes are used to link the findings back to specific interview transcripts. For example, T1 refers to transcript number 1. Data analysis strategies recommended by Creswell (2013) were followed. Interview notes and transcriptions were read multiple times to ascertain the main points in each interview. These main points were then written down and grouped into themes that cut across multiple interviews. Findings obtained through the interviews were used to develop survey questions. We used descriptive statistics, specifically frequencies and percentages, to analyze the survey results.

Results

To what extent do instructors believe they are proficient with the course management systems they are currently using?

The SSO and PSM instructors use a variety of course management systems, often at or below an intermediate level of self-perceived proficiency (Table 1). In the interviews, some instructors said they used or had used multiple course management systems. Of the instructors surveyed, a majority used Blackboard (52%, n = 11). Moodle (38%, n = 8) was another popular system. Ninety percent (n = 9) of Blackboard users and 89% (n = 8) of Moodle users rated themselves at an intermediate or novice level of proficiency.

To what extent do instructors believe they are proficient with the tools they are using in their online courses?

A majority of the SSO and PSM instructors used email (100%, n = 21), web links (81%, n = 17), grade reports for students (71%, n = 15), online discussions (62%, n = 13), online audio lectures (62%, n = 13) and online exams (62%, n = 13). A majority of instructors rated their proficiency with e-mail as advanced or expert (65%, n = 130). Fewer than half rated their proficiency as advanced or expert regarding web links (44%, n = 7), grade reports for students (20%, n = 3), online discussions (23%, n = 3) and online audio lectures (16%, n = 2).

Do SSO and PSM instructors see any barriers to improving online teaching techniques that could be overcome through professional development?

Instructors consistently mentioned time as a barrier in both the survey and interviews. The instructors felt that distance education courses were made to help save time by not having to be in a lecture or classroom for three or more hours a week. However, instructors now spend that time putting the course together and maintaining the course website.

Time (95%, n = 20) was the most common barrier to improving online education (Table 3) and a majority of instructors thought it was a highly significant barrier (70%, n = 14). One instructor (T6) stated that online

Table 3. Instructors' Perceptions of Barriers to Improving Distance Teaching Techniques

Barrier	Is a barrier f (%)	Significance f(%)[y] Slightly significant	Moderately significant	Highly significant
Time	20 (95%)	3 (15%)	3 (15%)	14 (70%)
Lack of hands-on interaction	16 (76%)	2 (13%)	9 (56%)	5 (31%)
Lack of instructor experience	16 (76%)	7 (44%)	4 (25%)	5 (31%)
Lack of face-to-face interaction	15 (71%)	5 (33%)	7 (47%)	3 (20%)
Lack of immediate feedback from students	11 (52%)	7 (58%)	4 (33%)	1 (8%)
Technology Failures	10 (48%)	2 (22%)	6 (67%)	1 (11%)
Funding	7 (33%)	0 (0%)	6 (86%)	1 (14%)
Other	3 (14%)	1 (33%)	2 (67%)	0 (0%)

Not every instructor responded to the question of whether something was a barrier and also rated the significance of that barrier.
[y] Percentages may not sum to 100 because of rounding.

courses are not easier and if they're done right they do not take less time than actual face-to-face meetings. It might be more convenient for both the instructor and the students, but they still take a lot of time.

Another instructor (T3) said it takes more time to teach online courses than traditional courses:

The biggest barrier to distance ed in general is it takes so much more time to do the same amount of teaching. And if you buy into the needing to have a one-on-one relationship with the student then it continues to take that time. So, I think originally there was a lot of thought that we could offer this at a distance and enrollment is irrelevant. And any number of students can be enrolled. And certainly the feedback I get from students and from instructors is that, that's not the case. They feel like they need really regular kind of relationship development between instructors and students.

A majority of instructors also indicated that lack of hands-on interaction (76%, n = 16), lack of instructor experience (76%, n = 16), lack of face-to-face interaction (71%, n = 15) and lack of immediate feedback from students (52%, n = 11) were barriers to the improvement of distance teaching techniques. Almost one-third of instructors believed that lack of hands-on interaction (31%, n = 5) and lack of instructor experience (31%, n=5) were highly significant barriers to the improvement of distance teaching techniques.

A majority (57%, n=12) of instructors agreed or strongly agreed that they find it hard to teach hands-on topics in an online course (Table 4). Facilitating hands-on learning was a common concern raised by instructors (T1, T3, T6, T7, T8) during the interviews. One instructor (T8) commented that "*the things that you typically do hands-on, that we do typically in labs here or more traditional classes, I think are going to be pretty hard to convey and translate to an online class.*" Another instructor (T3) said that "*you can't give them [the student] hands-on experience without the animal and so to me it's a compromise that you're reaching out to a lot of students that otherwise wouldn't get anything.*"

Some instructors (T4, T6, T7) said it can be difficult to achieve the same course outcomes in face-to-face and online classes. One instructor (T4) said "*I think, to be truly conversant with the ideas, is a little more challenging.*" Another instructor (T7) said, "*I don't think you can expect the same outcomes from both and I don't think you can expect the same teaching outcomes from an online course and from a classroom course. And I think if you try to do that, you're going to be disappointed.*"

Most instructors (T1, T2, T3, T5, T8) believed that students were able to obtain all of the desired course outcomes online. When asked if students were able to attain all of the desired outcomes, one instructor (T3) replied, "I hope so. If we didn't think so, then we shouldn't even offer the courses." This discrepancy was also evident in the survey results (Table 4). Thirty-three percent (n = 7) of instructors disagreed with the statement "Students are able to comprehend the concepts in my online course(s) equally as well as they would in a traditional classroom," but 24% (n = 5) agreed with the statement and 43% (n = 9) were neutral. Results were similar for the statement "*I feel there is no difference in the outcomes I want to achieve between an online class and a traditional classroom.*" Twenty-nine percent (n = 6) of instructors disagreed with this statement, 24% (n = 5) agreed, 10% (n = 2) strongly agreed and 38% (n = 8) were neutral.

What specific professional development activities do instructors want and how do they want the activities to be conducted?

Most instructors agreed or strongly agreed that they wanted to learn techniques to increase student interaction (90%, n = 19), that they wanted a hands-on training session using the tools they will learn about (90%, n = 19), that they wanted to brainstorm with other instructors on what strategies and techniques work best in teaching online courses (86%, n = 18) and that they wanted research-based data on what teaching techniques have worked best (91%, n = 19) (Table 5). One instructor (T3) described how research-based data could be useful to instructors as they make decisions about teaching, noting that a particular strategy "might be the best for student learning, but it takes twice as much time as this next thing which is 80% good."

Table 4. Instructors' Perceptions of Achievement of Student Outcomes (n = 21)

Statements	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
I find it hard to teach hands-on topics.	1 (5%)	4 (19%)	4 (19%)	9 (43%)	3 (14%)
Students are able to comprehend the concepts in my online course(s) equally as well as they would in a traditional classroom.	0 (0%)	7 (33%)	9 (43%)	5 (24%)	0 (0%)
My students' online discussions are better than discussions in a traditional classroom.	0 (0%)	7 (33%)	11 (52%)	2 (10%)	1 (5%)
I feel there is no difference in the outcomes I want to achieve between an online class and a traditional classroom.	0 (0%)	6 (29%)	8 (38%)	5 (24%)	2 (10%)

Note. Percentages may not sum to 100 because of rounding.

Table 5. Instructors' Preferences Relative to Professional Development (n = 21)

Statements	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
I want to learn techniques and strategies to increase student interaction.	0 (0%)	0 (0%)	2 (10%)	8 (38%)	11 (52%)
I want to have a hands-on training session using the tools we will be learning about.	0 (0%)	0 (0%)	2 (10%)	11 (52%)	8 (38%)
I want to brainstorm with other instructors on what strategies and techniques work best in teaching online courses.	0 (0%)	0 (0%)	3 (14%)	10 (48%)	8 (38%)
I want to be presented research-based data on what online teaching techniques have worked best.	0 (0%)	0 (0%)	2 (10%)	13 (62%)	6 (29%)
I want to learn where I can get shelf-ready teaching materials for my classes.	2 (10%)	0 (0%)	4 (19%)	13 (62%)	2 (10%)
I want to learn new video editing techniques.	1 (5%)	0 (0%)	8 (38%)	8 (38%)	4 (19%)
I want to be able to present material from my own class so that I may receive feedback from the other instructors and experts at the workshop.	2 (10%)	4 (19%)	7 (33%)	7 (33%)	1 (5%)
I want to learn what the SSO and PSM program staff want us to teach.	2 (10%)	1 (5%)	3 (14%)	11 (52%)	4 (19%)
I want to experience online learning from a student's perspective.	1 (5%)	3 (14%)	4 (19%)	11 (52%)	2 (10%)

Note. Percentages may not sum to 100 because of rounding.

Summary

Instructors in the SSO and PSM programs want to learn teaching strategies and techniques to increase student interaction in online courses and they prefer to learn this through a hands-on workshop. Because instructors have rated themselves as having intermediate- to novice-level proficiency with course management systems and varying levels of proficiency with other online education tools, a hands-on workshop would be well suited for this group. Instructors identified time as a significant barrier to professional development and to improving online instruction. The instructors value research-based information.

Our key findings are consistent with previous needs assessment studies related to distance education. For example, our finding that instructors wanted to learn strategies to enhance interaction was consistent with Simerly's (1990) finding that faculty wanted to enhance their communication with students. As with our study, Murphy and Terry (1998) and Miller and Carr (1997) found that faculty wanted to learn teaching techniques for distance learning. Faculty have shown consistency over time concerning their professional development needs for teaching at a distance. Technology is the variable that continues to change at a rapid pace. The challenge is in preparing faculty to effectively use new technologies in addressing normal teaching and learning-related issues.

As a result of this study, we recommended that the USPCE conduct a professional development workshop with sessions on time management related to online education, promoting interaction in online courses and using research-based strategies for online education. Based on the findings, we also recommend that persons involved in organizing the professional development workshop pay careful attention to design. It would be wise to carefully consider at least four of Knowles, Holton and Swanson's (2005) six assumptions regarding adult learning theory. These include making sure participants know why it is important for them to learn what is offered through the workshop, using their past experiences as a valuable teaching and learning resource that respects them as learners, capitalizing on their readiness to learn by focusing on their self-identified needs and motivating them to learn by emphasizing application to their specific situations. We plan to conduct additional research to track the extent to which these recommendations are implemented and their effects on the SSO and PSM programs.

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A Model of Faculty Cultural Adaption on a Short-Term International Professional Development Experience

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Abstract

College of agriculture graduates must be prepared to work effectively within a global workforce and to have cross-cultural experiences. Unfortunately, every student is not able to participate in study abroad programing. However, students benefit from global perspectives integrated into the curriculum. Teaching faculty must possess an understanding of culture in order to effectively educate their students. The purpose of this study was to develop a grounded theory to explain the process of cultural adaptation that occurred when one group of U.S. faculty traveled abroad for a short-term professional development experience. The following eight stages emerged from the study: preparation and planning, excitement, frustration, building relationships, cultural comparisons, cultural understanding, cultural appreciation, advancing expertise and future plans. Faculty participants uniquely experienced a variety of stages of cultural adaptation, although not in the same sequence. Facilitators of similar experiences should take these stages into account as they plan study abroad programs.

Introduction

Graduates from colleges of agriculture must be prepared to work in a global economy (National Research Council, 2009). A globalized agricultural industry requires graduates with cross-cultural experiences and an understanding of agricultural issues around the globe (Acker, 1999). A preferred way to provide international experiences for undergraduates is study abroad (Tritz & Martin, 1997). However, financial limitations and language differences are often reported as barriers to studying abroad (Briers, Shinn, & Nguyen, 2010). Faculty can avoid these barriers while simultaneously reaching more students by integrating global perspectives in courses they teach on-campus (National Research Council, 2009). However, this approach requires faculty to have an understanding of both the culture and the technical discipline as applied in a given country. This study explores how faculty adapted during a short-term international professional development experience in Trinidad and Tobago.

Conceptual Framework/Review of Literature

This study was conducted with the intent of developing grounded theory to explain the process of cultural adaptation that occurred when one group of U.S. college faculty traveled abroad for a short-term professional development experience. As Lincoln and Guba (1985) acknowledged, "*No a priori theory could anticipate the many realities that the inquirer will inevitably encounter in the field, nor encompass the many factors that make a difference at the micro (local) level*" (p. 205). However, this study was informed by two contrasting works on culture shock (Oberg, 1960) and the intercultural adaptation process (Hottola, 2004), specifically in the tourism sector. These works helped the authors to consider the phenomenon of cultural adaptation prior to exploring its existence in an academic professional development context. An overview of the relevant theories follows.

The concept of culture shock was first described by Oberg (1960) to describe the unpleasant feelings and stress a sojourner experiences in an unfamiliar culture. Oberg hypothesized that four stages exist within the process of culture shock: honeymoon, crisis, recovery and adjustment. These stages follow the "U-Curve" pattern proposed by Lysgaard (1955) to represent the

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emotional highs and lows associated with the process of culture shock. The honeymoon stage is characterized by the excitement and euphoria associated with being in a new environment. Sojourners are likely to overlook minor grievances and focus on the positive. The honeymoon stage gives way to the crisis stage as sojourners begin to experience frustration and anxiety as a result of the differences between the new environment and their home environment. A lack of familiarity may drive the sojourner to seek interactions with other nationals from their home country (Oberg, 1960). Oberg identified the crisis stage as the point where true culture shock occurs.

In the recovery stage, sojourners take action to increase their comfort in the new environment. This may include learning the local language and customs as well as developing new relationships with host nationals (Manz, 2003). The final stage of Oberg's (1960) theory of culture shock features the adjustment of sojourners to the host society. Sojourners accept the norms and values of the new society and no longer experience the same levels of anxiety.

Subsequent researchers have been critical of Oberg's (1960) theory of culture shock. Brown and Holloway (2008) found international postgraduate students' feelings of excitement were overshadowed by their anxieties and frustrations, contrary to Oberg's characterization of the honeymoon stage. Church (1982) questioned whether or not it was imperative for sojourners to proceed through the stages in order and challenged the lack of key indicators specific to each stage. Ward and Kennedy (1993) asserted the focus on culture shock had impeded more valuable investigations examining "the process and product of cross-cultural transition" (p. 221).

An alternative to focusing on the shock experienced by sojourners when traveling has been provided by the emerging study of intercultural adaptation. Intercultural adaptation seeks to understand the psychological, emotional, ecological and behavioral aspects of "tourists' learning process in the new environment" (Hottola, 2004, p. 447). Using case studies of backpackers in South Asia, Hottola proposed the dynamic model of culture confusion as a grounded theory for explaining intercultural adaptation. Hottola's (2004) dynamic model of culture confusion begins with an initial onset of culture confusion. Culture confusion "focuses both on the problematic part of the adaptation process and on the frequently simultaneous presence of enjoyment, success and learning" (Hottola, 2004, p. 453). Confusion initially occurs at the very beginning of an international experience, brought on by the onslaught of new information. The initial phase of confusion lasts only a few days as sojourners begin to develop a basic understanding of the new environment (Hottola, 2004). Rather than the initial euphoria described by Oberg (1960), Hottola described the frequently variable emotions of the initial phase as both positive and negative, with a tendency toward the negative as sojourners begin to adjust to the realities of their new environment. The first impressions developed by a sojourner during the initial phase may influence his/her attitude for the remainder of the travel experience.

Further deviating from Oberg (1960), Hottola (2004) described the initial phase as the phase where "shock" is mostly likely to occur resulting from extreme disappointment, sensory overload, or a combination of both. Individuals who find themselves experiencing overload shock will regress in their experience; as explained by Hottola: "*Not infrequently, much time is spent within the accommodation during the first few days in the new environment, with periodical short excursions to the potentially stressful public space*" (2004, p. 457). Spending too much time in isolation away from the public space or having continued negative experiences - especially illnesses - associated with the public space can lead sojourners to develop negative perceptions of the differences that exist in their new environment (Hottola, 2004). This hampers intercultural adaptation.

A phase of adaptation and opposition follows as tourists begin to form more concrete attitudes towards their new environment (Hottola, 2004). Adaptation is associated with increased knowledge and improved perceptions of control. Adaptative sojourners are likely to want to return to the same place again someday. Conversely, sojourners experiencing opposition tend to view the hosts and their cultural differences with hostility, have trouble interacting with members of the host culture and are highly unlikely to ever return. Hottola found high levels of adaptation and opposition were unlikely to develop in short-term sojourners, due to the lack of long-term immersion in the new environment, although significantly positive (e.g. developing friendships) or significantly negative (e.g. experiencing harassment) experiences may cause short-term sojourners to become adaptative or oppositional more quickly than expected.

According to Hottola (2004), "*the majority [of sojourners] probably have feelings of relief and euphoria of returning home mixed with feelings of longing for their travel experiences, new friends and tourist/sojourner status*" (p. 460) during the readjustment period. Reverse culture confusion may occur as sojourners struggle to reconcile what they have learned during their travels with the values and norms of home. In some cases, sojourners may even prefer the other environment but generally readjustment will not be a major issue following short-term experiences (Hottola, 2004).

Although insightful, the theories outlined above may not be sufficient to explain the cultural adaptation experiences by university faculty members who travel abroad on a short-term professional development experience. This group of people is likely more educated than the average tourist and the purpose of this travel (professional development for faculty) likely created a different kind of experience than typical tourism. This research will seek to understand this phenomena of cultural adaptation in this specific context.

Purpose

The purpose of this study was to develop a grounded theory to explain the process of cultural adaptation that occurred when one group of U.S. faculty traveled abroad for a short-term professional development experience.

Methods

Context

In March of 2011 a group of eight faculty from the College of Agriculture and Life Sciences at Texas A&M University spent 10 days in Trinidad and Tobago to learn more about agriculture and culture. Travel was funded by a USDA grant designed to help faculty integrate global examples into their courses back on their home campus. Global examples were integrated through the development of Reusable Learning Objects (RLOs) that would be used to educate students on campus. In addition to these faculty participants, there were two faculty coordinators and two graduate students in agricultural education from Texas A&M University and two of the researchers from the University of Florida who accompanied the group. While in Trinidad and Tobago, the group had frequent contact with faculty and students from the University of the West Indies.

Faculty participants included three females and five males. Areas of study included human nutrition, youth, fisheries, horticulture, GIS/GPS, education and distance education. The participants were from the following locations: California, Italy, Ukraine, Texas, Tennessee, Japan, Oklahoma and North Carolina. Additionally, the two faculty coordinators were from Texas A&M University and included one female and one male professor originally from Texas and Alabama. Areas of expertise include social science/educational research design and program evaluation. The two graduate students were females from Texas and Indiana studying agricultural leadership.

The trip included a wide variety of activities, including frequent visits to the campus of the University of the West Indies (UWI), tours of agricultural operations and visits to cultural and environmental sites of interest. The entire group was together for about half the time. During the remaining time, participants accompanied hosts from Trinidad to explore sites of interest related to their disciplinary expertise. The group spent eight days in Trinidad and then two days in Tobago. In Trinidad, the entire group stayed at a family-run bed and breakfast located in a suburban area outside of Port of Spain and near the UWI campus. While in Tobago the entire group stayed in a tourist hotel near the airport and the beach.

Data Collection

Primary data for this study were collected though semi-structured interviews and during a focus group conducted while on the trip. The semi-structured interviews took place throughout the entire program and participants were interviewed individually, in pairs, or as a group. Nine individual interviews, two paired interviews, 2 group interviews and one focus group took place. The focus group occurred in Tobago on the last night in the country. Participants were asked to reflect on their experiences on the trip and express how they were impacted. Secondary data were collected through participant observation by the two researchers. Primary data were used as the basis for this study and the secondary data were used to help interpret primary data.

Data Analysis

A third researcher who did not attend the trip initially analyzed data and then the team of researchers collaborated on final interpretation of the data. Prior to data analysis, the transcript from the focus group was reviewed three times by the researcher. The first reading allowed the researcher to gain familiarity with the transcript; the second reading allowed the researcher to think about the data in terms of the proposed research question and the third reading allowed the researcher to reduce the data set by disregarding any data that was deemed irrelevant based on the specific research question.

The reduced data set was analyzed using the constant comparative method. The constant comparative method was used because it allowed the researcher to identify patterns within the data (Dooley, 2007). In order to draw connections between identified patterns (Dooley, 2007), the following procedures were used: open coding, axial coding and selective coding (Corbin & Strauss, 1990). Line by line coding was used during the open coding phase of data analysis in order to categorize the data line by line (Glaser, 1978). In accordance with Charmaz (2006), the researcher completed line by line coding as quickly as possible to help ensure that the codes that emerged were based on the data and not pre-conceived ideas. Once each line of the transcripts was coded, the researcher began axial coding in order to differentiate and separate the identified codes from the first stage of coding (Grbich, 2007). Axial coding categorizes the data by bringing the segmented data that emerged during open coding back into a coherent whole (Strauss & Corbin, 1990). The final stage of analysis was selective coding. Selective coding allowed the researcher to systematically select categories, compare across categories and explain the relationships that emerged from the data (Strauss & Corbin, 1990).

Additionally, the researcher used in vivo coding throughout the analysis process. In vivo coding allowed the researcher to "preserve participants' meanings of their views and actions in the coding itself" (Charmaz, 2006, p. 54). The researcher used the in vivo codes to gain a deeper understanding of what was happening within the context of the participants (Charmaz, 2006).They also helped to ensure that the researcher's analysis of the data was representative of the participants' experience (Charmaz, 2006). The Codes that emerged from data analysis were used to develop stages of cultural adaptation.

Once the third researcher finished the initial analysis of the data, the three researchers met to discuss initial findings. The other two researchers helped refine and clarify the emergent themes using field notes gathered during participant observation of the experience. This served as a mechanism to triangulate the data and ensure trustworthiness (Lincoln & Guba, 1985). Trustworthiness was also ensured through the use of prolonged engagement and persistent observation (Lincoln & Guba, 1985). Additionally, an audit trail was maintained by the researchers to track methodological decisions and a member check was conducted.

Data is presented below in the form of statements directly from participants and in summarizing statements from the researchers. Participants are represented using aliases to ensure their confidentiality.

Results and Discussion

The findings of this study have been organized in the form of overarching stages that include preparation and planning, excitement, frustration, building relationships, cultural comparisons, cultural understanding, cultural appreciation, advancing expertise and future plans. The stages and sub-stages will be expanded upon throughout the following sections.

Preparation and Planning

Participants did not entirely know what to expect from the Trinidad and Tobago faculty international professional development experience. In preparation for the experience, faculty members consciously thought about their feelings and experiences that they may encounter during the experience. Mark recognized the invitation to attend the experience as a wonderful opportunity, but did not have any idea of what to expect from this experience. In addition, prior to the experience, Mark struggled with why the program leaders wanted to travel with a large group of faculty members and take on more responsibilities. However, Carrie had the opposite concern. She was struggling with how she would fit in with a group of faculty from the college of agriculture, since she was the only faculty member from a different college. Janet expected to view the faculty study abroad experience through a problem focused lens that would enable her to focus on the country.

Academic Focus

There was a major focus on the creation of the reusable learning objectives (RLOs). Mike noted that he focused on the academic expectation of the experience, which was to create RLOs. Forethought was given to what type of academic information that would be useful in the preparation of the RLOs (Mike). Bob also believed that the focus of the experience was to create teaching materials based on technical content. Carrie stated, “I came here on this trip knowing that I had to look consciously look for data that I could use for my RLO…” The focus on the RLOs prior to the faculty study abroad experience brought on some frustration and anxiety towards the RLOs. Mike said, “I’m not sure I still understand exactly what that [RLO] is. RLO that’s sort of a mysterious concept.”

Excitement

Participants experienced excitement from time to time throughout the experience. Sara expressed excitement to be on the trip and to try new foods. She was also eager to learn about agriculture within Trinidad. Sara was very excited to learn about how the youth are taught in Trinidad. Additionally, Carrie felt excitement when she witnessed a conversation that led to a discussion on research methods. Excitement was not only experienced in regards to teaching and academics. Excitement was also experienced through the interactions with the people of Trinidad. Sara was passionate about “understanding the people and social behavior” prevalent in Trinidad. Mark was also eager to learn about the culture in Trinidad as well as participate in traditional tourist activities.

Frustration

Participants also experienced frustration. Faculty struggled with the length of the experience and the amount of time away from their families (Tom). However, Tom indicated that the study abroad experience was purposefully long in order to allow the participants to gain an understanding of the culture of Trinidad and Tobago. Frustration regarding the length of the experience diminished after the fifth or sixth day of the program and participants began to understand the importance of a lengthy program that provided plenty of opportunity for cultural immersion (Tom). Additionally, the food caused frustration with some of the participants. Tom complained about the food being too spicy to eat and that the spiciness caused upset stomachs.

Building Relationships

The interactions with local people from Trinidad and Tobago helped the participants to have a positive experience. Tom indicated that emersion in the culture and interactions with the people of Trinidad and Tobago would allow relationship development. Mike validated Tom’s suggestion by indicating that the interactions with local people and the formation of relationships were some of the most meaningful activities of the experience. Interactions with the people of Trinidad and Tobago were not isolated to the professional workplace. Sara was invited and welcomed into a woman’s home. The woman did not mind that the house was not perfectly clean or that holiday decorations were still up (Sara). Sara felt that the act of being invited into a stranger’s home helped to forge a lifelong friendship and contributes to her desire to return to the country. Additionally, interaction with local people allowed Kate to experience everyday life in a meaningful way that is often overlooked on vacations.

Extended interactions with people from Trinidad and Tobago allowed for the participants to continuously experience the culture of the country. In referring to the UWI faculty and students who accompanied the group, Mark said, "I also appreciate the fact that you guys have been with us constantly and that was like having a piece of the country always with us."

Cultural Comparisons

Participants compared their observations and experiences to the observations and experiences that they have had in the United States (U.S.). Bob was surprised when he observed the geography because he thought that Trinidad would look like east Texas or the coast of Florida. Comparisons were being made in order to make sense of their observations. David and Bob noticed that the airport was built right along the beach. They both mentioned that the beach was prime real estate and therefore would not be used for an airport in the U.S.. David noticed that the rest of the beach looked similar to beach areas in the U.S. However, people in Trinidad and Tobago do use the beach for recreation and to relax with their families (David).

David noticed that the cities in Trinidad looked like cities in the U.S., but there was one major difference. The cities in Trinidad had people walking livestock down the road (David). While driving to the bed and breakfast, David noticed that there were many nice homes, but they had bars over the windows, which is not something that you would typically see in the U.S. if the home was in a safe area.

Comparisons were made regarding the mother/daughter relationships in Trinidad. The mothers in Trinidad are extremely protective of their daughters and strive to protect their daughters' reputations (Kelly). The protectiveness is similar to other cultures including people in the U.S. (Kelly). However, there was a difference when it came to mothers and daughters dressing provocatively for Carnival (Kelly). Kelly stated that "*the mother and daughter are both wearing these fabulous costumes and it's like I can't see most American mothers doing that.*" The acceptance of the provocative Carnival costumes has come about due to the celebratory tradition of Carnival (Kelly).

Cultural Understanding

It was through interactions with people in Trinidad and Tobago that allowed the participants to gain an understanding of the culture. Sara was able to ask the students at the UWI questions in order to understand how the people of Trinidad and Tobago view poverty, race and classes. A deeper conversation allowed Sara to begin to understand cultural issues that are present in Trinidad and that are not brought up in casual conversation. Sara recognized that not all aspects of culture are positive and the negatives combined with the positives provide the framework of the culture.

In an effort to be respectful, Emily had to figure out if it was culturally acceptable for the locals to eat meat. Once Emily realized that people in Trinidad commonly consumed meat, it was much easier for her to operate within the cultural norms. Additionally, Mark realized that Caribbean culture is different on each island. David realized many people in Trinidad go without the appropriate amount of food and have unsafe living conditions. However, Mark asserted that despite the poverty and poor living conditions, the people seemed very happy.

Cultural Appreciation

Even though participants experienced frustration due to the length of the experience, it was that length that allowed the participants to spend time getting to know the people of Trinidad and Tobago (Tom). According to Bob, relationship building helped him to realize how rich the experience was and how interactions with people allowed for the exploration of culture. Kate felt that she began to realize the importance of the culture in Trinidad and Tobago through a focus on everyday life. Kate's experiences in the local markets allowed her to gain a cultural understanding while experiencing cultural appreciation through participating in the everyday activities that take place in Trinidad and Tobago. Participants felt that the cultural immersion allowed them to focus on the culture (Carrie; Kelly).

Additionally, participants showed cultural appreciation through their openness and eagerness to return to the country. Mark felt that their interactions with the people in Trinidad helped them to better understand the culture and to feel comfortable traveling within in the country and being exposed to the culture. Tom acknowledged that all aspects of travel are nice, but it is the people that make the travel meaningful. "Now I can say with nearly certainty that this won't be my last time in Trinidad and Tobago" (Tom).

Advancing Expertise

Faculty looked for opportunities to enhance their academic expertise and teaching skills. Bob purposefully looked for opportunities to explore production agriculture in Trinidad. Through the observation of production agriculture, Bob was able to get a feel for agriculture in Trinidad and incorporate that into his knowledge base. Similarly, Joe acknowledged that the creation of the RLOs increased his knowledge base and would enhance his teaching skills. Additionally, communication with the professors at the UWI enabled Joe to discuss research and gain different perspectives within the field.

Future Plans

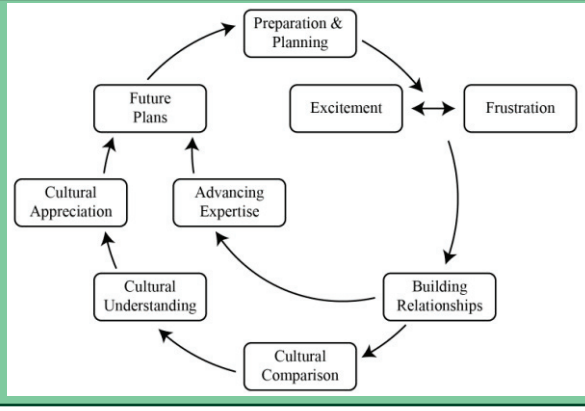
The accumulation of positive and negative experiences led the faculty to anticipate their next trip to Trinidad and Tobago. Four of the participants decided that it would be beneficial for their students to visit Trinidad and Tobago through a study abroad program (David;

Lynn; Larry; Ryan). Mark stated that he would not hesitate to return to Trinidad on his own due to this recently acquired knowledge of the Trinidad and Tobago culture. In agreement with Mark, Joe said that he would return and contact some of the people through this program. Additionally, Mark agreed with many other participants and decided that he was going to keep some of his Trinidad money to encourage himself to return. Tom stated, "I can say with nearly certainty that this won't be my last time in Trinidad and Tobago" and that he would be willing to purchase Trinidad and Tobago money from other people. Similarly, Sara said, "*For Carnival I'm coming back and so for me to say I'm coming back I'm going to take…[Tom's] advice and keep my tt's [local currency] and that way I know I'll be back.*"

Conclusions, Implications and Recommendations

Faculty participants experienced a variety of stages of cultural adaptation, although not in the same sequence. Faculty participants went through a series of stages that were inconsistent with the existing tourism models (Hottola, 2004; Oberg, 1960). The stages experienced by participants included: preparation and planning, excitement, frustration, building relationships, cultural comparisons, cultural understanding, cultural appreciation, advancing expertise and future plans. The researchers have chosen to present these stages in the form of a cycle (see Figure 1).

Figure 1. Faculty cultural adaptation on a short-term international professional development experience.



The cycle begins with preparation and planning, which is characterized with both uncertainty about the experience and advanced thinking about expectations for the experience. The previous literature (Hottola, 2004; Oberg, 1960) did not explicitly address stages that might occur prior to travel, but it is plausible that tourists have similar feelings about preparation and planning.

Next faculty oscillated between excitement and frustration. They were excited about the opportunities, but were frustrated with the sacrifices made to travel and some of the food experienced on the trip. This dynamic interplay would be similar to Hottola's (2004) cultural confusion, which Hottola characterized as a period with mixed emotions. It may also correspond with Oberg's (1960) stages of honeymoon and crisis. It would appear that in this regard that the faculty participants in the current study were similar to tourists in previous studies.

After arriving in the country, the faculty began building relationships, which continued throughout the experience. The previous research from the tourism literature (Hottola, 2004; Oberg, 1960) did not consider stages related to building personal relationships, although Oberg did express that in the recovery stage travelers might seek new relationships with host nationals. The lack of emphasis on relationships in the tourism models is understandable because the typical tourist experience is likely more focused on seeing landscapes and artifacts, as opposed to interacting with individual people.

Next, faculty progressed through two parallel pathways. On one pathway, faculty were interested in learning more about the people, first with cultural comparison when faculty compared their observations to what they know from the U.S.. Neither of the existing models (Hottola, 2004; Oberg, 1960) had a stage or phase where travelers explicitly compared their surroundings to their own country, although Hottola's opposition phase involved highlighting differences and Oberg's crisis stage also involved travelers focusing on differences. Interestingly, the two aforementioned theories characterized these as more negative stages or phase, which is different than observed on the current experience. The participants seemed to highlight differences from a more objective, observational perspective. This could be attributed to the research training that faculty received in their degree programs.

As they advanced, faculty started to seek out cultural understanding to gain a deeper insight into the people. This stage aligns with Oberg's (1960) recovery stage in which the tourist begins to gain comfort in the new environment. This stage would also correspond to Hottola's (2004) adaptation phase, although Hottola suggested that this might not occur on shorter experiences.

A few of the faculty then progressed to cultural appreciation and embraced the local culture with an eagerness for continued interactions with the people. This is also similar to Hottola's (2004) adaptation phase where the travelers embrace the local culture and seek out opportunities for more immersive experiences. Hottola suggested that this does not often happen on short-term experiences, which implies that a short-term faculty professional development experience might be different than a typical short-term tourist experience.

On the parallel pathway, which happened concurrently with learning about the people, faculty were focused on advancing expertise. This stage was an intentional focus of this particular experience and thus differentiates it from other types of tourist experiences (Hottola, 2004; Oberg, 1960). Observations by the researchers would suggest some faculty had challenges balancing the goals of learning about the people and learning more about their respective disciplines.

Finally, faculty completed the cycle by considering future plans, with most faculty expressing a desire to return to the country. Hottola (2004) referred to this group as adaptive sojourners, or travelers that had adapted to the environment and were interested in future interactions. Hottola further suggested that travelers might also face a period of readjustment and reverse cultural confusion as they transition back into their own culture. This phenomenon was not observed on this experience, likely because of the shorter duration.

A short-term faculty international professional development experience created the catalyst for faculty to move through a series of stages as they reacted and adapted to the experience. It was exciting to see that a short-term, intense experience was successful in eliciting a variety of responses from faculty. Given their busy schedules, many faculty are more likely to engage in a short-term experience, rather than a more prolonged experience. The evidence gathered in this study should be helpful in validating the potential impacts of these types of short-term experiences.

Facilitators of similar experiences should take these stages into account as they plan their trips, especially the parallel pathways related to learning about the people and advancing their own technical expertise. Maintaining an appropriate balance will likely lead to a more successful experience and greater satisfaction from faculty participants. Facilitators should also recognize that all participants may not go through each stage and participants may move through the stages at differing rates. Frequent interactions with participants will allow the facilitator to help individual participants process their experiences.

This research was conducted in a specific context. The format and activities of the experience were very intentional to provide faculty with an opportunity to advance both their understanding of the people and advance their expertise. Additionally, Trinidad and Tobago is an English-speaking nation and although the dialect was different, participants could easily communicate with the people. An experience in a different culture might yield different stages. Additional research should seek to explore other types of experiences.

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Graduate Teaching Assistants' Sense of Teaching Self-Efficacy in a College of Agricultural Sciences and Natural Resources

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Abstract

The Teachers' Sense of Efficacy Scale was used to measure graduate teaching assistants' perceived self-efficacy in four constructs: (a) overall teaching efficacy, (b) student engagement, (c) instructional strategies and (d) classroom management. Graduate teaching assistants in the College of Agricultural Sciences and Natural Resources at the University of Tennessee were moderately efficacious in instructional strategies, student engagement, classroom management and overall teaching efficacy. Furthermore, a majority of graduate teaching assistants did not have prior teaching experience. This coupled with the fact that a majority did not participate in university pedagogical training may partially explain why the graduate teaching assistants did not possess a high sense of self-efficacy in their overall teaching abilities or their self-efficacy in student engagement, instructional strategies and classroom management. With that in mind, future research should examine the explanatory power of various prior teaching experiences and teaching and learning training opportunities. This information should aid departments and colleges of agriculture in selecting and training graduate teaching assistants. Moreover, investing in the development of a high sense of teaching efficacy among graduate teaching assistants may prove to be an important element in ensuring the educational quality of undergraduate education.

Introduction

A growing trend in recent years has been the increased use of graduate teaching assistants in undergraduate education. Several factors have contributed to this, including administrative pressure to reduce instructional cost (Bettinger and Long, 2004) and the shifting of faculty responsibilities to include more graduate education and research (Shannon, Twale and Moore, 1998). In this environment, graduate teaching assistants are being used more often as primary instructors instead of supporting faculty instruction, which has placed them in a position to have a greater influence on the quality of undergraduate education (Weidert et al., 2012). To that end, many graduate teaching assistants have been thrown into the classroom to fulfill the role of instructor for a course with limited teaching experience (Drake, 1997) and are "expected to be experts in their discipline and knowledgeable of the appropriate pedagogical strategies for undergraduate instruction" (Luft et al., 2004, p. 212). Consequently, they are often subjected to the sink or swim method of learning to teach and as a result, concerns have been raised regarding the effectiveness of graduate teaching assistants and their educational influence (Bettinger and Long, 2004). Some universities have responded by offering courses or training in teaching and learning, while others have made little effort to provide training for these graduate students turned instructors (Komarraju, 2008).

This could be problematic for colleges of agriculture, who have recently been charged with the task of improving instruction and teacher effectiveness (National Research Council, 2009). With this in mind, one factor contributing to teacher effectiveness is self-efficacy (Shaughnessy, 2004). Self-efficacy or efficacy expectation is the level to which people feel they can perform up to expectation (Bandura, 1993). Bandura (1993) suggested people by

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nature are unsettled or anxious pertaining to uncertainty and instead of facing apprehension about the unknown, people foster a sense of self-efficacy to predict the outcomes of their efforts. A person's motivations, actions, effort and perseverance are all altered by one's self-efficacy (Bandura, 1997). Self-efficacy is not a set of traits people do or do not possess, but instead, self-efficacy is an inward and personal analysis of self that helps a person determine whether or not they will be successful at completing tasks. When self-efficacy is high, individuals feel self-assured and have control over the given situation – this control results in success for the individual. While Bandura (1997) acknowledged the significance of having the proper skills to complete a task, he also suggested that having the self-belief of knowing how to use the skills was equally as important.

According to Bandura (1997), self-efficacy is an internal personal factor within social cognitive theory. Thus, self-efficacy is an internal personal factor that influences behavior and the external environment. Bandura posited the three aforementioned determinants, personal factors, external factors and behaviors influence each other bi-directionally, but these influences are not of equal strength and may not occur simultaneously (Bandura, 1997). Additionally, the determinants must be considered within the social construct that the person is operating. These social structures can provide additional resources or restraints that would cause a person's self-efficacy to change based on the given situation (Bandura, 1997). Moreover, self-efficacy beliefs are constructed through mastery experiences, vicarious experiences, verbal persuasion and physiological and affective states (Bandura, 1997). Bandura (1997) stated mastery experiences are the greatest contributor to a strong sense of self-efficacy. If a person masters a skill or situation, that person moves forward with a strong sense of confidence to repeat success in a same or similar situation, thus positively building their self-efficacy. The opposite is true if the person experiences failure in a given situation.

When the theory of self-efficacy is tied to understanding teacher effectiveness it becomes labeled teacher efficacy or teaching efficacy (Wolf, 2011). Teacher efficacy is a person's self-belief in their "capability to organize and execute courses of action required to successfully accomplish a specific teaching task in a particular context" (Tschannen-Moran et al, 1998, p. 233). Teacher efficacy is cyclical in nature (Tschannen-Moran et al, 1998).

Greater efficacy leads to greater effort and persistence, which leads to better performance, which in turn leads to greater efficacy. The reverse is also true. Lower efficacy leads to less effort and giving up easily, which leads to poor teaching outcomes, which then produce decreased efficacy. Thus, a teaching performance that was accomplished with a level of effort and persistence influenced by the performer's sense of efficacy, when completed, becomes the past and a source of future efficacy beliefs. (Tschannen-Moran et al, 1998, p. 234)

Wolf (2011) stated that while many components have been argued to contribute to a teacher's sense of self-efficacy, research has indicated teaching experience is a key element to increased self-efficacy. Additionally, a teacher's sense of efficacy is influenced by their training and past experiences (Shaughnessy, 2004). Training and past experience directly relate to teachers' observable behaviors in the classroom and are pieces of the conceptual model that appear to influence the ability of the teacher in the classroom. Many graduate teaching assistants are expected to fill the role of instructor without any prior teaching experience or training (Komarraju, 2008). Graduate teaching assistants' lack of experience or training has the potential to negatively impact the quality of undergraduate education. Research has shown teaching efficacy is related to student achievement and motivation, effort exerted in teaching (Tschannen-Moran and Hoy, 2001), planning and organization (Allinder, 1994), perseverance through challenges and undesired results (Goddard et al., 2004) and willingness to modify instructional methods to meet student needs (Guskey, 1988). Conversely, if graduate teaching assistants' pedagogical knowledge, skills and self-efficacy are cultivated, this could have a positive effect on undergraduate education. Furthermore, if graduate teaching assistants can be effective alternatives to faculty, this might allow institutions of higher education to reduce undergraduate instructional cost and permit tenure-track faculty to focus on graduate education, research and outreach without negatively impacting the quality of undergraduate education.

Purpose and Objectives

The National Research Council (2009) indicated the need for improvements in undergraduate education and called for an increase in research-based instructional strategies to promote student learning. Because under-prepared graduate teaching assistants are increasingly being used as instructors and teaching efficacy plays a pivotal role in the behaviors exhibited by teachers, an investigation into the teaching efficacy of graduate teaching assistants is warranted. Therefore, the purpose of this study was to describe the teaching efficacy and preparation of graduate teaching assistants in the College of Agricultural Sciences and Natural Resources at the University of Tennessee. The following objectives framed this study:

1. Describe the teaching and learning preparation of graduate teaching assistants.
2. Describe the overall teaching efficacy of graduate teaching assistants.
3. Describe the efficacy in instructional strategies of graduate teaching assistants.
4. Describe the efficacy in student engagement of graduate teaching assistants.
5. Describe the efficacy in classroom management of graduate teaching assistants.

6. Compare overall teaching efficacy, efficacy in instructional strategies, efficacy in student engagement and efficacy in classroom management of graduate teaching assistants based upon prior experience and university training.

Methodology

Research Design and Population

The research design was descriptive survey research and consisted of a census of all graduate teaching assistants (N = 22) in the College of Agricultural Sciences and Natural Resources at the University of Tennessee. Thus, the results of the study should not be generalized beyond the College of Agricultural Sciences and Natural Resources at the University of Tennessee. The sampling frame was established by contacting the graduate coordinators of each department in the College of Agricultural Sciences and Natural Resources at the University of Tennessee. The graduate coordinators were asked to supply the names and emails of all graduate teaching assistants in their department. Upon approval by the Institutional Review Board at the University of Tennessee, invitations to participate in the study were electronically sent to all graduate teaching assistants in the sampling frame during the Fall 2012 academic semester. To maximize participation, sampling procedures as recommended by Dillman et al. (2009) were followed. An initial email was sent to potential participants informing them of the forthcoming study and inviting them to participate. The second email was sent a week after the first and contained a link to the instrument. Additionally, two follow-up emails, which contained links to the instrument, were sent to the participants as reminders. After the emails and a follow-up phone call all graduate teaching assistants responded, thus a census of the population was obtained.

The graduate teaching assistants' ages ranged from 22 to 33 years old with a majority of the graduate teaching assistants between 22 and 26 years old (M = 25.1, SD = 3.0) . Of the 21 graduate teaching assistants that reported gender, 12 (57.1%) were male and 9 (42.9%) were female. The self-reported ethnicity of the graduate teaching assistants was 14.3% Asian, 9.5% Black or African American and 76.2% White and all but one of the graduate teaching assistants were pursuing a master's degree with the remaining graduate teaching assistant pursuing a doctorate. During the Fall 2012 academic semester, the number of courses taught or assisted by the graduate teaching assistants ranged from 1 to 3 with a mode of 1.

Instrumentation and Data Analysis

The data were collected using Qualtrics, an online survey software system, to administer the Teachers' Sense of Efficacy Scale (Tschannen-Moran and Hoy, 2001). The Teachers' Sense of Efficacy Scale contains 24 Likert-type items that measure teachers' perceived self-efficacy in four constructs: (a) overall teaching efficacy, (b) student engagement, (c) instructional strategies and (d) classroom management. However, the researchers excluded one item that pertained to involving parents of students, because they deemed that this is not typically applicable in college teaching situations. Sample items on the adapted Teachers' Sense of Efficacy Scale include, "How much can you do to get through to the most difficult students," "How well can you respond to difficult questions from your students," and "How much can you do to control disruptive behavior in the classroom?" Responses were measured on a scale of 1, nothing, to 9, a great deal. Reliabilities for the Teachers' Sense of Efficacy Scale reported by Tschannen-Moran and Hoy (2001) were α = .94 for overall teaching efficacy, α = .91 (efficacy in instructional strategies), α = .87 (efficacy in student engagement) and α = .90 (efficacy in classroom management). For this study, post-hoc reliabilities for the adapted instrument in overall teaching efficacy, efficacy in instructional strategies, efficacy in student engagement, efficacy in classroom management were .95, .92, .83 and .91, respectively. In addition, after completing the adapted Teachers' Sense of Efficacy Scale, the graduate teaching assistants also completed a 10 question demographic survey that included open and closed-ended questions.

Data were analyzed using IBM SPSS version 20. Constructs were summated to analyze the data. Descriptive parameters (frequencies, percentages and means) were used to describe the demographic characteristics of the graduate teaching assistants and responses for individual items of the adapted Teachers' Sense of Efficacy Scale. In addition, based on prior research (Wolf, 2011), the researchers combined response categories 1–3, 4–6 and 7–9 into low, moderate and high self-efficacy, respectively.

Results

Objective 1

Describe the teaching and learning preparation of graduate teaching assistants. A majority (76.2%) of the graduate teaching assistants indicated they did not receive training in teaching and learning by the university. Those who did receive training completed one of the following: (a) graduate teaching assistant orientation, (b) training on being a student-athlete tutor provided by the university's athletics student life center, or (c) the best practices in teaching program offered by the university's graduate school. For these programs, the training hours ranged from one to nine. Furthermore, a majority (71.4%) of graduate teaching assistants had no prior teaching experience. Those who had prior teaching experience indicated they had at least one of the following roles: (a) secondary substitute teacher, (b) Sunday school teacher, (c) secondary academic tutor, (d) postsecondary academic tutor, (e) workshop presenter and/or (f) equine riding instructor.

Objective 2

Describe the overall teaching efficacy of graduate teaching assistants. The summated mean for overall teaching efficacy was 6.0 (SD = 1.3) with a range of 2.0 to 7.9. Four graduate teaching assistants (18.2%) possessed high self-efficacy in their overall teaching ability, 17 (77.3%) possessed moderate self-efficacy in their overall teaching ability and one (4.5%) possessed low self-efficacy in his or her overall teaching ability.

Objective 3

Describe the efficacy in instructional strategies of graduate teaching assistants. The summated mean for efficacy in instructional strategies was 5.9 (SD = 1.7). As shown in Table 1, a majority of the graduate teaching assistants perceived themselves as having a high sense of self-efficacy or capable of responding to difficult questions, gauging student comprehension of subject matter taught and providing alternative explanations or examples to clarify a concept for students. Furthermore, 50% of the graduate teaching assistants perceived themselves as capable of crafting good questions for their students and a majority of graduate teaching assistants reported low or moderate capability on four items: (a) adjusting your lesson to the proper level for individual students, (b) using a variety of assessment strategies, (c) implementing alternative instructional strategies and (d) providing appropriate challenges for very capable students.

Objective 4

Describe the efficacy in student engagement of graduate teaching assistants. The summated mean for efficacy in student engagement was 5.5 (SD = 1.0). As shown in Table 2, a majority of graduate teaching assistants did not perceive themselves as capable or having low capacity on any of the student engagement items. To that end, the graduate teaching assistants perceived themselves as moderately capable on all student engagement items, thus, perceiving themselves as having a moderate capacity for getting through to the most difficult students, helping students to think critically, motivating students who show low interest, getting students to believe they can do well on school related task, helping students value learning, fostering student creativity and improving the understanding of a student who is failing.

Objective 5

Describe the efficacy in classroom management of graduate teaching assistants. The summated mean for efficacy in classroom management was 6.1 (SD = 1.7). As shown in Table 3, a majority of the graduate teaching assistants perceived themselves as capable of making expectations clear about student behavior, getting students to follow classroom rules and keeping a few problem students from ruining an entire lesson. Additionally, 50% of the graduate teaching assistants perceived themselves as capable of controlling disruptive behavior in the classroom and a majority of graduate teaching assistants reported low or moderate capability

Table 1. Graduate Teaching Assistants' Scores on the Instructional Strategies Self-Efficacy Items

	Low		Moderate		High	
	f	%	*f*	%	*f*	%
How well can you respond to difficult questions from your students?	2	9.1	8	36.4	12	54.5
How much can you gauge student comprehension of what you have taught?	2	9.0	8	36.4	12	54.4
To what extent can you craft good questions for your students?	1	4.5	10	45.5	11	50.0
How much can you do to adjust your lessons to the proper level for individual students?	2	9.6	14	66.6	5	23.8
How much can you use a variety of assessment strategies?	4	19.1	10	47.6	7	33.3
To what extent can you provide an alternative explanation or example when students are confused?	1	4.8	7	33.4	13	61.9
How well can you implement alternative strategies in your classroom?	4	19.0	8	38.0	9	42.9
How well can you provide appropriate challenges for very capable students?	4	19.1	7	33.3	10	47.6

Table 2. Graduate Teaching Assistants' Scores on the Student Engagement Self-Efficacy Items

	Low		Moderate		High	
	f	%	*f*	%	*f*	%
How much can you do to get through to the most difficult students?	4	18.1	15	68.1	3	13.6
How much can you do to help your students think critically?	1	4.5	14	63.6	7	31.8
How much can you do to motivate students who show low interest in school work?	2	9.0	16	72.7	4	18.2
How much can you do to get students to believe they can do well in school work?	1	4.5	12	54.5	9	40.9
How much can you do to help your students value learning?	1	4.5	12	54.6	9	40.9
How much can you do to foster student creativity?	2	9.0	12	54.5	8	36.3
How much can you do to improve the understanding of a student who is failing?	3	14.3	12	57.3	6	28.6

Table 3. Graduate Teaching Assistants' Scores on the Classroom Management Self-Efficacy Items

	Low		Moderate		High	
	f	%	*f*	%	*f*	%
How much can you do to control disruptive behavior in the classroom?	5	22.7	6	27.2	11	50.0
To what extent can you make your expectations clear about student behavior?	1	4.5	8	36.3	13	59.1
How well can you establish routines to keep activities running smoothly?	2	9.0	10	45.4	10	45.5
How much can you do to get students to follow classroom rules?	1	4.8	8	38.1	12	57.1
How much can you do to calm a student who is disruptive or noisy?	2	9.6	10	47.6	9	42.8
How well can you establish a classroom management system with each group of students?	1	5.0	10	50.0	9	45.0
How well can you keep a few problem students from ruining an entire lesson?	1	4.8	7	33.4	13	61.9
How well can you respond to defiant students?	2	9.5	9	42.9	10	47.6

Table 4. Graduate Teaching Assistants' Teaching Efficacy Differences Based on Experience and Training

	Prior experience				University training			
	Yes		No		Yes		No	
	μ	*σ*	*μ*	*σ*	*μ*	*σ*	*μ*	*σ*
Student Engagement	5.9	0.50	5.4	1.2	6.1	0.9	5.3	1.0
Instructional Strategies	6.7	1.00	5.8	1.7	6.2	1.4	6.0	1.7
Classroom Management	6.1	1.03	6.3	1.8	6.4	0.8	6.2	1.8
Overall Teaching Efficacy	6.3	0.62	5.8	1.5	6.2	0.9	5.9	1.4

on four items: (a) establishing routines to keep activities running smoothly, (b) calming a student who is disruptive or noisy, (c) establishing a classroom management system with each group of students and (d) responding to defiant students.

Objective 6

Compare overall teaching efficacy, efficacy in instructional strategies, efficacy in student engagement and efficacy in classroom management of graduate teaching assistants based upon prior experience and university training. As described under objective one, the graduate teaching assistants did not have extensive training or experience in teaching and learning; however differences in efficacy scores were found (Table 4). Graduate teaching assistants with prior experience or university training in teaching and learning had higher scores in overall teaching efficacy, student engagement and instructional strategies. For classroom management, graduate teaching assistants with university training had higher efficacy scores in classroom management, but those with prior teaching experience had lower efficacy scores in classroom management.

Summary, Discussion and Recommendations

Being a graduate teaching assistant can be overwhelming for an individual, especially when they are the sole instructor of a class. As Luft (2004) stated "*graduate assistants are expected to be experts in their discipline and knowledgeable of the appropriate pedagogical strategies for undergraduate instruction*" (p. 212), which can place a heavy burden on many graduate teaching assistants. The graduate teaching assistants in the College of Agricultural Sciences and Natural Resources at the University of Tennessee perceived themselves as moderately efficacious in overall teaching efficacy, student engagement, instructional strategies and classroom management. Theoretically, not being efficacious in the aforementioned constructs, which are represented as personal factors in Bandura's (1997) social cognitive theory, may negatively influence graduate teaching assistants' teaching behaviors and ultimately the quality of undergraduate education. Empirically this is important because teaching efficacy is related to teacher effectiveness (Shaughnessy, 2004), student achievement and motivation, effort exerted in teaching (Tschannen-Moran and Hoy, 2001), planning and organization (Allinder, 1994), perseverance through challenges and undesired results (Goddard et al., 2004) and willingness to modify instructional methods to meet student needs (Guskey, 1988). These findings are also important because teacher efficacy is cyclical in nature – higher efficacy leads to higher performance and lower efficacy leads to lower performance (Tschannen-Moran et al., 1998). Consequently, the graduate teaching assistants in this study may only be preforming at moderate levels.

Within each of the measured constructs, there were several areas in which the graduate teaching assistants did not perceive themselves as efficacious. Some of those areas were adjusting the lesson to the proper level for individual students, using a variety of assessment strategies, implementing alternative instructional strategies, providing appropriate challenges for very capable students, establishing routines to keep activities running smoothly, calming a student who is disruptive or noisy, establishing a classroom management system with each group of students and responding to defiant students. Moreover, a majority of graduate teaching assistants did not have prior teaching experience. This coupled with the fact that a majority did not participate in university pedagogical training may partially explain why the graduate teaching assistants did not possess a high sense of self-efficacy in their overall teaching abilities or their self-efficacy in student engagement, instructional strategies and classroom management. With that in mind, future research should examine the explanatory power of various prior teaching experiences and teaching and learning training opportunities. This information should aid departments and colleges of agriculture in selecting and training graduate teaching assistants.

Supporting the need for the research suggested above, differences were found in this study in regard to teaching and training experiences. In general, the graduate teaching assistants that completed training or had prior teaching experience had higher self-efficacy scores. This is encouraging since their teaching and training experiences were minimal (e.g., 1 to 9 hours of university training in teaching and learning). What is more, their self-efficacy beliefs appear to be malleable and this is also encouraging since teaching efficacy stabilizes over time and is difficult to alter once stabilized. (Tschannen-Moran et al., 1998).

Based on the results of this study, the College of Agricultural Sciences and Natural Resources at the University of Tennessee should consider taking action to improve the teaching efficacy beliefs of their graduate teaching assistants. According to Bandura (1997), self-efficacy beliefs are constructed through mastery experiences, vicarious experiences, verbal persuasion and physiological and affective states. Of these sources of self-efficacy, mastery experiences are the greatest contributor to efficacy beliefs (Bandura, 1997). Currently, the College of Agricultural Sciences and Natural Resources does not offer a pedagogical training

program for graduate teaching assistants. Therefore, the researchers recommend the college consider developing a formal pedagogical training program for graduate teaching assistants that includes mastery experiences such as microteachings, peer teachings and lesson plan and syllabi development with an emphasis on those areas where graduate teaching assistants report low to moderate efficacy. Additionally, the college should utilize the university's best practices in teaching program, as the program was intended, to supplement a college or departmental pedagogical program (University of Tennessee, 2013). These recommendations not only align with Bandura (1997), but they are also consistent with Wolf (2011) who stated that teaching experience is the key element to increased self-efficacy. What is more, the college should also consider making the training program a requirement before graduate teaching assistants enter the classroom, since 76.2% are not completing the university's program or the university's graduate teaching assistant orientation. Requiring graduate teaching assistants to participate in a formal pedagogical training program that includes mastery experiences in the areas of low to moderate efficacy identified in this study should positively influence the development of teaching efficacy.

An additional possibility to consider for developing graduate teaching assistants' teaching efficacy is a formalized mentoring program in which graduate assistants are paired with teaching faculty, a representative from a university teaching and learning center, or other experienced educators to provide guidance, support and formal evaluation of the graduate teaching assistant's instruction. As part of the mentoring experience, the researchers suggest mentors and the graduate teaching assistants work together to develop a professional growth plan. The purpose of a professional growth plan is to identify pedagogical weaknesses and establish pedagogical goals and procedures for improving instructional knowledge and practices. Additionally, completing a college teaching methods course and/or a certificate program in teaching and learning may also be viable options for improving teaching efficacy and if available, colleges of agriculture could utilize the educational expertise of departments of agricultural education to improve graduate teaching assistants teaching efficacy.

Future research should investigate the items recommended above and determine the most appropriate avenues for fostering a high sense of teaching efficacy among graduate teaching assistants. Additionally, future research should examine other graduate teaching assistant populations' teaching efficacy beliefs and seek to quantify the impact graduate teaching assistants are having on the quality of undergraduate education. Investing in the development of a high sense of teaching efficacy among graduate teaching assistants may prove to be an important element in ensuring the educational quality of undergraduate education.

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Effect of a Soil Microbial Activity Laboratory on Student Learning[1]

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Abstract

Soil microbial activity contributes to soil and environmental quality. A detailed description of a laboratory exercise is provided that provides direct measures of soil microbial activity in 3 soil treatments: control (soil only), alfalfa (soil + alfalfa meal) and redwood (soil + redwood sawdust) is laid out and discussed. Students assess microbial activity in several ways: by comparing the odor generated, by observing the presence of fungal mycelia and by measuring NO_3^- levels in the treated soil by two methods. Measuring NO_3^- levels in two ways enables students to gain an understanding of how to compare benefits and deficits of different methods used to determine the same parameter. Measures of microbial activity are related to carbon and nitrogen cycles so that students may better understand how their experimental observations relate to the cycling of organic matter and nutrients. Understanding gained by students leads to a better appreciation of how organic matter and microorganisms affect the overall health of the ecosystem. Students earned a 60% average score on a pre-laboratory quiz. Students earned a 77.1% average score after completing the laboratory and writing a laboratory report. The gain in average student score was interpreted as significant as assessed by Cohen's D (1.27).

Introduction

The purpose of this article is to clarify, within the context of Soil Science, how introductory college students develop their ability to collect and analyze scientific data in the completion of a scientific laboratory report assignment (Hattey and Patton 2009, Shukla and Sammis, 2012). Through this process, students produce a laboratory report in which they develop a hypothesis, test the hypothesis through data collection, then determine if the hypothesis is accepted or rejected.

Soil nutrient dynamics and organic residue decomposition are crucial processes contributing to soil and environmental quality. Organic matter (OM) decomposition and subsequent production of humus, release of nutrients to the soil environment, production of energy (heat), etc. provide the basis for many diverse ecological food-webs. The diversity of microbial communities as well as their abundance within soils results in soil being the most biologically diverse ecosystem on Earth (Yarwood and Sulzman, 2008). Moreover, nitrogen cycling plays a large role in soil fertility and environmental quality (Vitousek et al., 2009). Therefore, it is crucial that introductory-level undergraduate students be exposed to and begins to understand the role soil microbes play in organic matter and nitrogen cycling.

At California Polytechnic State University, San Luis Obispo (Cal Poly), Introductory Soil Science (SS 121) is a four unit (three hours of lecture and one three hour lab per week) course taught every Fall, Winter and Spring quarter and typically has between seven to nine laboratory sections per quarter. Each laboratory section has a maximum of 24 students from many majors within the College of Agriculture, Food and Environmental Sciences and a few majors outside the college (Table 1). Soil Science 121 is an introductory course designed for college freshmen and has no pre-requisites. The experiments performed in the laboratory are set-up to follow lecture topics. The experiments described in this article build on what has been done at Cal Poly for over a decade in the Soil Organic Matter, Humus and Microbial Activity laboratory experiment, which typically takes place toward the end of the quarter.

This article describes several simple procedures to assess microbial activity and nitrogen cycling in soil in a laboratory setting. The experiments are best suited to introductory-level environmental or soil science students. The experiment can be set-up by students or a technician in a short amount of time (15 min). After an incubation period (ideally 4 weeks when the laboratory temperature is ~ 25° C and the moisture content of the soil is maintained near field capacity), samples can be analyzed within a 3-hour laboratory period by the

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Table 1. Typical characteristics of Cal Poly's laboratory portion of Introductory Soil Science course (SS 121).

Characteristic	Supporting Information
Typical class size (students)	20-24
College of Agriculture, Food, and Environmental Sciences (CAFES) majors taking course (represents 90% of all CAFES students)	Agricultural Business, Agricultural Science, Agricultural and Environmental Plant Sciences, Agricultural Science, Agricultural Systems Management, Bioresources and Agricultural Engineering, Environmental Earth Sciences, Environmental Management and Protection, Environmental Soil Science, Forestry and Natural Resources, and Wine and Viticulture
Majors outside the CAFES taking course (represents 10% of all students)	Biological Sciences, Chemistry, Civil Engineering, and Landscape Architecture
Year in school of students taking course	Freshman (50%), Sophomore (25%), Junior (15%), Senior (10%)
Total number of laboratory exercises students complete in course	Nine

students. The day of analysis is when class discussion on organic matter and nitrogen cycling takes place.

Learning Objectives

Upon completion of this exercise, students should be able to:

1. Construct relevant graphs that visually display the results of the experiments.
2. Understand the difference between qualitative data vs. quantitative data.
3. Define humus and organic matter and understand what makes them different.
4. Measure microbial transformations of organic matter and nitrogen in one soil by several methods.
5. Compare methods of determining microbial activity in soil.
6. Know the products of organic matter decomposition.
7. Understand how the carbon to nitrogen ratio (C/N) of organic materials applied to soil influences nitrogen availability.
8. Learn the carbon and nitrogen cycles.

Materials and Methods

Experimental Set-up (by technician)

This part of the experiment is performed by the instructor or a technician a few days prior to when the students begin the experimental set-up. We have found the ideal soil texture to use for these experiments is loamy sand with ~ 1 % OM. We have experimented with soils having more clay; however, experimental results were less consistent than when using a loamy sand textured soil. Air-dried soil was passed through a No. 10 sieve and all particles coarser than 2 mm were removed. The sieved soil was divided into 3 treatments: a control treatment (soil only), an alfalfa treatment and a redwood treatment. The alfalfa and redwood were added to the soil at a rate of 2.5 %m. Deionized water was added to all 3 treatments to bring the soil water content to field capacity (~ 20 %m).

Experimental Set-up (15 minutes): Week 1

Students, in groups of 3 to 4, prepare 2 control, 2 alfalfa and 2 redwood soil samples for a 4 week incubation period by adding an amount of 25±3 g (experimentation has demonstrated that a relatively large range in starting sample masses produces similar data) of each treatment to appropriately labeled, 100 mL wide-mouth plastic containers with lids. Initial measurement should include the mass of the soil + plastic container and the temperature of the laboratory.

Incubation Period (5 minutes/week): Weeks 2 – 4 Laboratories

The student groups are reminded to check the moisture status of their treatments at some point during each of the laboratory periods of weeks 2 to 4 and record the ambient temperature of the laboratory.

Analysis and Discussion (2.5 hours): Week 5 Laboratory

Organic matter cycling

The laboratory period begins with a discussion of the carbon cycle using Equation [1] and a diagram of this cycle from Brady and Weil (2008).

organic substances + microorganisms + suitable environment ------>

CO_2 + H_2O + energy + humus + new microbial cells + inorganic plant nutrients [1]

Through the lens of Equation [1], students and instructors reflect on the results of the experiment that has been going on for four weeks [1]. The discussion focuses on organic nutrient cycling, microorganisms, what constitutes a suitable environment for microorganisms and benefits of humus to ecosystem function, an interactive critical thinking exercise. The students are shown examples of alfalfa meal and redwood sawdust and are asked probing questions to ensure they are aware of the differences between them. A brainstorming discussion on microorganisms follows where the students are asked where they think the microorganisms originated from in the experiment. Next, a list of common soil microorganisms is generated. The students and instructor jointly develop a list of factors to define a suitable environment for microorganisms and decomposition. Finally, students are asked to define the benefits of having humus in the soil and the role of soil microbes in nutrient cycling in ecological systems.

Teacher Instructions for Guiding Student Observation of Soil Samples

The laboratory class session during the fifth week of the quarter is dedicated to data collection and analysis. Students are instructed to collect the samples they have been monitoring over the past four weeks. At this point

in the experiment it is particularly important to remind students not to open the lids of the plastic containers. Prior to opening the containers, the students are instructed to formalize a hypothesis based on expected physical and chemical characteristics of various treatments. It is also explained that one indicator of abundant microbial activity is the presence of an earthy-musty odor. Students are asked to develop a hypothesis about which of their treatments should have had the greatest microbial activity during the incubation period. This activity can then be used to facilitate a discussion considering the desirable "qualities" of various soil types. This initial class discussion should ensure that prior to proceeding; students understand that they should expect different results from the various experimental treatments.

After the initial discussion of the scientific method and hypothesis testing, students are told to open their samples and pay particular attention to how they smell and look. The students and instructor then discuss that odor is a qualitative variable and can be converted to a quantitative variable by creating an odor scoring system. Another topic for discussion is the cause of odor is primarily due to actinobacterial and cyanobacterial activity within the soil. The two volatile metabolites primarily responsible for producing this odor are geosmin and 2-methylisoborneol (Stahl and Parkin, 1994).

The students use a datasheet (Table 1) to rank (higher order thinking skills) their samples in terms of the earthy-musty odor. The instructor helps students establish a 10 point scale where 0 = no earthy-musty odor and 10 = very strong, earthy musty odor. In establishing the measurement criteria, students may also be introduced to the concept of scientific practice and the need to develop numerical criteria with which to evaluate differences among treatments in an experiment. The instructor may also points out that this quantitative approach is only truly valid for comparing treatments within an experiment that have undergone similar procedures. The instructor should also stress the importance of doing things exactly the same between the three treatments and procedurally within a treatment will greatly reduce errors in measurement.

The next task for students is to visually observe similarities and differences among treatments, before, after, or at the same time as they are assessing the odor differences among treatments. Ideally, each group of students will have access to a microscope to check for the presence of fungal mycelia. The presence of mycelium is an important indicator of microbial activity and is easy to observe with a microscope. A datasheet can be developed to convert the mycelia data into a quantitative variable by developing a scale for measurement. For example of a 10 point scale, 0 = no observable mycelia and 10 = mycelia are visible without the aid of the microscope.

The typical results for this experiment find the earthy-musty odor and presence of mycelia follow similar trends. The alfalfa treatment has the greatest earthy-musty odor and greatest quantity of fungal mycelia, followed by the control and then the redwood has the lowest amount of odor and mycelia. It is important to note that through oratory replication over many years, the differences in student opinion about the ranking of the treatments in terms of intensity of earthy-musty odor and amount of fungal mycelia is slight.

Nitrate Extractions

The duplicate treatments are separated and one set of samples undergoes a simple extraction with 1 M $NH_4C_2H_3O_2$ pH 4 and the other set of samples is brought to saturation with DI (deionized) H_2O. Both of these procedures are for determination of NO_3^-. The 1 M $NH_4C_2H_3O_2$ pH 4 extraction (NO_3^- Red method) is similar to a procedure outlined by Singh (1988). The 1 M $NH_4C_2H_3O_2$ pH 4 is made by placing ~ 400 mL DI H_2O in a 1 L volumetric flask and slowly adding 40 mL glacial $HC_2H_3O_2$ and 10 mL NH_4OH. The solution is then made up to 1 L by adding additional DI H_2O. The final solution pH is typically 4 and does not require pH adjustment. The extraction is performed by adding 40 mL of the 1 M $NH_4C_2H_3O_2$ pH 4 to each plastic container and stirring the samples with glass stir rods for 2 min. The samples are set aside to allow the suspended soil to settle out prior to filtering the liquid supernatant. The other set of samples is brought to saturation by adding ~ 8 g DI H_2O (NO_3^- Strip method). This extraction is similar to a procedure described by NRCS (2012). The samples are stirred to form a saturated paste and then a Whatman No. 1 filter paper, folded into a cone, is inserted into the saturated paste, cone tip pointed down and into the saturated paste until the tip of the filter paper contacts the bottom of the container. The sample is then set aside to allow time for water from the saturated soil paste to filter through the sides of the filter cone and accumulate.

Nitrogen Cycle

The nitrogen cycle is introduced in greater detail than before and discussed while the extracts are incubating. A diagram of the nitrogen cycle is discussed and related to the carbon cycle. The students are reminded that we will be determining the NO_3^- levels in their samples by two different methods. To check for student understanding, they are asked what processes of the nitrogen cycle had to occur in order for us to be able to determine NO_3^- levels. The fates and forms of nitrogen are also discussed at this time to provide, for example, an opportunity for students to understand why and how NO_3^- leaching takes place and how this process can lead to environmental quality problems.

C/N ratio

The concept of C/N ratio is constructed and this concept is related to the C/N ratios of the treatments as well as the processes of mineralization and immobilization. It is explained that optimal microbial decomposition/mineralization of organic materials occurs when

the C/N ratio of these materials ≤ 20 and that when C/N ratios are higher than this the nitrogen (NO_3^-) is rendered unavailable to plants and is immobilized by microorganisms. The alfalfa meal has a C/N ~ 13 whereas the C/N of the redwood sawdust > 600 (Brady and Weil, 2008). Based on this discussion, the students are asked to generate a hypothesis about how their samples will rank relative to each other in terms of measured NO_3^- levels.

NO_3^- Measurement – NO_3^- Red Method

The students are instructed to obtain glass observation vials (~ 15 mL capacity) as well as their NO_3^- Red filtered extracts and measure 10 mL of solution from each treatment. A ¼ tablespoon of nitrate colorizing powder is added to the glass observation vials. The nitrate colorizing powder is prepared in advance by grinding each of the following components with a mortar and pestle, mixing them one-by-one and then grinding them together into a fine, homogeneous powder, 37 g citric acid, 5 g manganese sulfate monohydrate, 2 g sulfanilamide, 1 g N-1-naphthylethelenediamine dihydrochloride and 1 g finely powdered zinc (Singh, 1988). These chemicals may all be purchased through Fisher Scientific (Fairlawn, NJ). It is recommended to prepare this powder fresh on a weekly basis; however, we have been able to store this material in a freezer (0° C) for up to 1 year without it losing its efficacy. The 10 mL extracts are poured into the glass observation vials containing the nitrate colorizing powder. Upon contact of the liquid extract with the powder, the mixture will turn a reddish-pink color with intensity proportional to the quantity of nitrate in the extract. The tops of the glass vials should be covered with parafilm and inverted several times for mixing. Between 1 and 5 min after mixing the extract with the powder, the treatments should be compared to each other for measurement of NO_3^-. After a period of about 5 min, the intensity of the reddish-pink color dissipates.

The reddish-pink color may be interpreted qualitatively or it may be easily measured quantitatively. One way to obtain an accurate numeric measure for the quantity of NO_3^- in the extract is to prepare several standard NO_3^- solutions from 0 – 200 (or higher if necessary) ppm and develop the reddish-pink color in the same way as the experimental samples. A color photo of the reddish-pink color developed in the standards can be used to make a comparison with the experimental samples.

NO_3^- Measurement – NO_3^- Strip Method

The students are instructed to obtain their NO_3^- Strip method samples. At this point, there should be clear solution that has filtered into the cone tip of the filter paper. Students should use an eye-dropper to transfer 2 drops of this solution onto the reaction zones of a nitrate test strip (we suggest EM Quant 10020 Nitrate Test Strips, Gallade Chemical, Santa Ana, CA as these strips have a dynamic range of 10 – 500 ppm) so as to thoroughly moisten the reaction zones of the test strip. Excess solution should be shaken off the reaction zones and the color of reaction zones should be compared to the color scale on the test strip container, after a period of 60 s, to obtain a value for NO_3^-. The EM Quant 10020 test strips measure both NO_3^- and NO_2^-; however, we generally disregard the values for NO_2^- as they are generally very low.

NO_3^- Measurement – Comparison of Methods and Data Analysis

A table may be used by the students to organize, compare and contrast their NO_3^- measurements. The students should be reminded that though they obtained numerical values for NO_3^-, their data are somewhat subjective based on their interpretation of the intensity of the reddish-pink color (in the case of the NO_3^- Red method) and the interpretation of the color of the reaction zones of the test strips (in the case of the NO_3^- Strip method). The data may also be graphed in order for the students to visually compare the NO_3^- measurements by each method. A discussion about potential sources of experimental error can follow and may include such considerations as importance of standardized data collection procedures, perceived accuracy, time of analysis, cost, generation of waste, etc.

Results and Discussion

The experiments described above build on what has been done at Cal Poly for over a decade in the Soil Organic Matter, Humus and Microbial Activity laboratory experiment, which typically takes place toward the middle to end of the 10 week term. We assessed the effectiveness of the experiments to meet the learning objectives (see Introduction) by conducting a pre- and post-laboratory 10 question multiple-choice quiz (Figure 1) aligned with the learning objectives (see Introduction section) in two laboratory sections (19 and 23 students, respectfully) with 42 students. Our goal was to gain a better understanding of how student involvement and participation in the exercise effected attainment of learning objectives related to organic matter and nutrient cycling in the soil environment.

One week prior to analysis and discussion of the experiments (week 4), students were given the complete laboratory procedures as well as background information related to the exercise and instructed to read these materials prior to coming to lab the following week. They were also given an informed consent form, indicating their agreement to participate in the identical pre and post laboratory assessment process.

Students had access, time and were encouraged to review the material and information covered on both the pre-exercise and post-exercise quiz. Students answered an average of 6.00 questions out of 10 correctly on the pre-exercise quiz, whereas the average on the post-exercise quiz was 7.71 (Table 2). Approximately 67% of the students were able to identify several ways microbial activity may be assessed on the pre-exercise quiz while

Figure 1. Pre and Post Exercise Quiz Questions

1. Soil organic matter includes:
a. Plant and animal residues at various stages of decomposition.
b. Cells and tissues of living soil organisms.
c. Substances synthesized by soil organisms.
d. All of the above

2. The products of organic matter decomposition include all of the following except:
a. Water b. Charcoal c. Nutrients d. Heat e. Humus

3. All of the following are examples of quantitative data except:
a. The amount of nitrate in units of mg/L.
b. The intensity of color represented on a scale from 1 to 10.
c. The intensity of smell represented as slight, medium, strong.
d. The amount of carbon dioxide in the atmosphere represented as a percentage.
e. The measurement of ocean wave height in feet.

4. The following factors are important when assessing soil microbial activity:
a. Soil temperature
b. Soil pH
c. Nutrient supply
d. Water content
e. All of the above

5. Cultivated soils lose humus by biological decomposition at a rate of:
a. Less than 1% per year.
b. 1-2% per year.
c. 2-5% per year.
d. 5-10% per year.
e. Up to 50% per year.

6. Microbial activity in soil may be determined by:
a. Observing the soil and looking for mycelia.
b. Assessing the degree of musty smell in soil.
c. Measuring the quantity of soil nitrate.
d. Determining the amount of soil humus.
e. All of the above.

7. Management such as ____ can be used to sustain humus levels and productivity.
a. Crop residue management
b. Conservation tillage
c. Crop rotations
d. None of the above
e. All of the above

8. Organic material having a high carbon to nitrogen ratio (C/N), such as barley straw (450/1)…
a. Will decay rapidly in the soil.
b. Will decay slowly in the soil.

9. Identify the process labeled #9 on the diagram† of the nitrogen cycle (diagram not shown here).
a. Immobilization b. Denitrification c. Nitrification d. Mineralization
e. Decomposition

10. Identify the process labeled #10 on the diagram† of the nitrogen cycle (diagram not shown here).
a. Immobilization b. Denitrification c. Nitrification d. Mineralization
e. Decomposition

†We used a simplified diagram of the nitrogen cycle similar to what is found in most introductory soil science text books.

91% of the students were able to do so on the post-exercise quiz. Moreover, the students had a much improved grasp of how the quality of organic matter sources, especially in regards to C/N ratios, affects decomposition after completing the exercise.

Most students (31 of 42; 78.6%) gained at least one point from pre quiz to post quiz. Half of the students (21 of 42; 50%) gained at least two points from pre quiz to post quiz. Table 3 delineates how students gained between the two points of measurement.

The assessment data suggest students had an improved understanding of organic matter decomposition as well as carbon and nitrogen cycling in soil after completing the experiments described above. The results supported our hypothesis of enhanced learning

Table 2. Pre & Post Quiz Scores (N=42).

Ten Question Quiz	Pre Quiz Mean Scores *(S.D.)*	Post Quiz Mean Scores *(S.D.)*	Difference	Cohen's D
	6.00 *(1.34)*	7.71 (1.33)	+1.71	1.27

Table 3. Gain by Student Frequency and Mode per Amount of Gain. (N = 42)

Pre to Post Gain	F	%	Range (Min. to Max.)
+5	2	4.7	3-9
+4	3	7.1	4-10
+3	8	19.0	4-9
+2	8	19.0	5-10
+1	12	28.6	3-9
+0	8	19.0	6-9
-1	0	0.0	0-0
-2	1	2.4	6-4
Overall	42	100.0	3-10

of key concepts of soil microbial activity. We attribute this to the fact that students were provided with opportunities to study, think about and evaluate carbon and nitrogen flux in soil not just as discrete elements from the periodic table, but in terms of their cycling in the soil environment. Using cycles and systems-thinking has been shown to be an effective means by which students develop higher-order cognitive skills (Zoller, 2012) and is necessary for them to understand soil's pivotal role in cycling nutrients (especially nitrogen) and driving ecosystem processes (Brady and Weil, 2008).

We also attribute the improvement in scores to the fact that students were provided with "learn-by-doing" or kinesthetic modes of knowledge acquisition. There is much educational research suggesting this is a beneficial way for students to learn and supplements other learning styles (e.g. visual, aural, read/write; Breckler et al., 2009; Eudoxie, 2011; Murphy et al., 2004).

The third factor to improved student understanding is the requirement that the students generate and test two hypotheses before they begin the analysis. Within their teams, students had to come to a consensus about the hypotheses prior to assessing and analyzing their samples (e.g. hypothesis testing). The first hypothesis was related to ascertaining which treatment (control, alfalfa, or redwood) should have had the greatest amount of microbial activity over the incubation period. The second hypothesis considered the same treatments and their relative levels of NO_3^- after the incubation period. Hypothesis development and testing are important components of the scientific method and allow/require students to critically evaluate their conceptions about a given set of experimental conditions (Burgh and Nichols, 2012; Vick et al., 2012). We noticed that this component of the exercise facilitated the students working together productively as well as take more ownership over their experiments.

Conclusions

This laboratory exercise allowed students to assess both physical and chemical factors of different organic materials and soils amended with those materials. The instructor-led discussions that take place during these experiments focus on three important concepts. First, we discuss the role of microorganisms in the carbon and nitrogen cycles. Second, we discuss differences in "quality" among organic materials that are commonly added to soils and how this

affects microbial activity. This leads to a dialogue about the influence of C/N ratios of organic materials on mineralization and immobilization. Lastly, the importance of the interconnectedness of microorganisms and their environmental conditions in nutrient and organic matter cycling in the larger ecosystem is conveyed.

This laboratory exercise has been most meaningful for students when the students have had prior exposure to some of the concepts found in the carbon and nitrogen cycles. It is particularly helpful when the students understand nutrient forms and how these forms (cations, anions and neutral species) move through the soil. It is also helpful when the students consider the three treatments (control, alfalfa and redwood) along with their nutrient contents (specifically C/N ratios). This reinforces the need for a control as a baseline treatment, which allows for meaningful comparisons of the other two treatments.

Assessments demonstrated that students' understanding of nutrient and organic matter cycling in soils increased as a result of completing this exercise. Students answered an average of 6.00 questions out of 10 correctly on the pre-exercise quiz and 7.71 out of 10 questions on the post-exercise quiz covering the exercise's learning objectives. This was most likely a result of the experiments and instruction focusing on systems-thinking, conducting the experiments in a "learn-by-doing" environment, as well as providing students with opportunities to generate and test hypotheses, which helped them take ownership and interest in what they were doing. To further validate the enhanced learning attributed to the laboratory experience, it would be interesting to test a group of students that don't do the pre-test to compare the results.

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Veterinary Students' Use of Crib Sheets in Preparing for Learning and Reducing Stress

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Abstract

The purpose of this exploratory study was to determine actual and perceptional differences in utilizing crib sheets for a Virology course in veterinary sciences. The objectives guiding the study were to describe the exam scores of Virology course students, describe the differences amongst exam scores of Virology course students and to describe perceptions of the use of crib sheets for Virology exams by students. The researchers found exams allowing the use of a crib sheets had higher averages than exams that did not allow crib sheet use. Student perceptions of crib sheet use were that it helped them to reinforce, remember and retain course material. Students also indicated they would prefer to use the crib sheet on other exams in Virology and in additional courses. Finally, the stress levels reported by students were lower during exams that allowed them to use a crib sheet.

Introduction

May and Casazza (2012) discovered college students pursuing a degree in the hard sciences experienced a higher level of perceived stress than soft science majors. Students enrolled in veterinary school are faced with many academic challenges of the hard sciences. The curriculum has become overloaded as colleges attempt to teach everything to every student (Bushby, 1994; Radostits, 2003). Competencies currently expected from veterinary medicine students upon graduation include: multispecies clinical expertise, one health knowledge: animal, human and environmental health and an increasing number of professional competencies (NAVMEC, 2011). It is almost impossible to learn the skills and competencies necessary to be confident in the content because of the ever-increasing knowledge base of veterinary medicine (Radostits, 2003). With the short time span of veterinary school and the considerable amount of information they are expected to retain, stress and anxiety can occur in students. Grade competition, exam preparation and amount of content to memorize are all academic stressors in college students (Abouserie, 1994). Specifically for veterinary medicine students, workload, grades and assessments were reported most frequently as sources of stress (Williams et al., 2005). Similarly, the top three stressors of veterinary medicine students identified by Kent-Arce (1991) are: exams, number of exams and types of exams; an inability to absorb all of the information; and final exams.

College students may not be consistently using effective coping strategies to manage their stress (Bland et al., 2012). Gelberg and Gelberg (2005) found the majority of veterinary medicine students were not even aware of their stress levels or their impact. Students with high levels of exam anxiety are typically lower performing than their peers (Benjamin et al., 1981). All students, regardless of their predisposition to exam anxiety, are negatively affected in both performance and motivation by highly evaluative classrooms (Hancock, 2001). With the increased stress placed on students, especially with high stakes exams, it is important the field find ways to reduce exam anxiety and stress. The veterinary medicine student population could risk burn out as a result of information overload and an emphasis on rote learning (Rex, 1993). Development of coping skills to positively handle stress is encouraged for veterinary medicine students in a recent report of the NAVMEC (2011). Managing stress can improve student performance in learning skills and problem solving (Gelberg and Gelberg, 2005). Moving past regurgitation and emphasizing understanding would benefit the profession. Exams focusing on understanding rather than recall can increase retention and help alleviate exam anxiety (Yu et al., 2010).

Crib sheets or cheat sheets could be one way of reducing exam anxiety in veterinary medicine students. A crib sheet is simply a sheet of notes created when preparing for an exam by a student to aid them in taking

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the exam (Raadt, 2012). Crib sheets have been found to increase student learning and reduce exam anxiety in the classroom (Erbe, 2007). There are different ways to implement crib sheets in the classroom to make them more effective. Some techniques could include requiring handwriting as opposed to typing and limiting the size of the crib sheet (Raadt, 2012). For many students, it is not the actual crib sheet itself that is helpful during the exam, but the act of making it themselves. "*Preparing the cheat sheets proved to be sufficient for learning what was on the test. This was the major difference between handing out information composed by me and having the students find their own*" (Erbe, 2007, p. 9). Exams requiring application or analysis were especially conducive to crib sheets because the students couldn't simply copy them (Erbe, 2007). In this way, exams do more than simply measure students learning, they actually contribute to student learning (Halamish and Bjork, 2011; Jacobsen, 1993).

Studies conducted by Raadt (2012) and Skidmore and Aagaard (2004) found students who used crib sheets improved their exam performance. Drake et al. (1998) determined crib sheets reduced text anxiety by providing security, meeting individual student needs, helping them prioritize and solve problems, think critically and freed them from excessive memorization so they could focus on learning the material. Dickson and Bauer (2008) conducted a study on undergraduate students in a psychology course and according to the students, making a crib sheet helped 91.8% of them learn the material and 87.8% improve their exam scores. Gharib et al. (2012) argued in various psychology courses, open book and cheat sheet exams were effective teaching tools, did not decrease retention and could even be superior to traditional closed book exams. Various college disciplines have made use of crib sheets in the classroom. Veterinary medicine may benefit from trying this technique. Are there ways to reduce exam anxiety without minimizing knowledge retention in veterinary medicine education?

Methods

The purpose of this exploratory study was to determine actual and perceptional differences in using a crib sheet for a Virology course consisting of veterinary medicine students. The following objectives and hypotheses were developed to meet the purpose:

1. Describe the exam scores of Virology course students
2. Describe differences amongst exam scores of Virology course students
3. Describe perceptions of the use of crib sheets for Virology exams by students

To accomplish objective 2, the following non-directional hypothesis was developed:

H1: There is a statistically significant difference between exam scores when Virology students used crib sheets and when they did not.

The population of the study was veterinary medicine students at the University of Missouri enrolled in a Virology course. The sample (n = 118) was students enrolled in the fall 2012 semester; the accepting sample, or those agreeing to participate, was 114 (96 %). Students were in their second year of the veterinary medicine program with an expected graduation date of 2015. Entering classes of veterinary medicine students at the University of Missouri are characterized by an average undergraduate GPA of 3.77 and an average GRE score of 1122. Upon admission to the veterinary medicine program, 97 of the students were females and 23 of the students were males from the graduating class of 2015. The University of Missouri Institutional Review Board approved the study protocol and all participants provided written informed consent prior to participation in the study.

For this study, some exams were permitted to have crib sheets and other exams were not. In particular, exams 1, 3 and 5 utilized crib sheets and exams 2 and 4 did not utilize crib sheets. The crib sheets were one half of one sheet of 8.5 x 11 inch (216 x 279 mm) paper on which students were permitted to write any information they deemed useful for the exam on one side. The exams were presented in a computerized multiple choice format.

To assess the perceptions of the students in regard to their use of the crib sheets, items were developed based upon the students use and, as literature described, in relation to helpfulness and stress. A panel examining face and content validity reviewed the items. There were eight items which utilized a Likert-type scale of 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree.

Data were collected in several ways. The data from the perceptions instrument were collected by one of the researchers in class without the instructor present, as to avoid coercion. The researcher also discussed the study and collected consent forms. The data from the exams were collected as a normal part of the class. Only the scores from those agreeing to participate in the study were used. The administration of exam 4 allowed for error due to a technical issue resulting in possible test-wiseness, thus exam 4 was removed from all of the analyses. The researchers acknowledge this as a limitation of the study because only one exam not utilizing crib sheets was factored into the analysis.

Data were analyzed using different statistical tools. For the descriptive statistics, which included the exam scores and the perception items, means and standard deviations were calculated. Exam scores were converted to percentages for ease of comparison. To compare exam scores, repeated measures ANOVA was calculated with the p value set at the .05 level a priori. A Bonferroni posthoc analysis was utilized to isolate the exams with statistical differences.

Results

When calculating the mean scores of the exams, Exam 1 was found to have the highest mean at 91.32% (SD = 4.72), while Exam 2 had the lowest mean of 84.80% (SD = 8.02). Table 1 summarizes the findings. A repeated-measures ANOVA was calculated to determine if statistical difference existed from exam to exam amongst the sample. When testing for the assumption of sphericity, it was found that the sample did not meet the assumption. Therefore, the Greenhouse-Geisser correction was found to be the most appropriate correction for the violation of the assumption (Field, 2009). From the analysis, a statistical difference ($F = 27.55$; $p < .001$) was found amongst the exam scores (Table 2). Therefore, the null hypothesis stating there is no difference among students' exams scores is rejected.

Table 1. Exam Score Means and Standard Deviations (Percentages)

Exam	Mean	Standard Deviation
Exam 1	91.32	4.72
Exam 2	84.80	8.02
Exam 3	86.63	6.85
Exam 5	90.61	5.33

Table 2. Repeated Measures ANOVA with Greenhouse-Geisser Correction between Exams

Source	Sum of Squares	df	Mean Square	F
Exams	3268.33	3.60	908.86	27.55***

***$p < .001$

Differences between exams were analyzed using the Bonferroni posthoc test because the overall repeated-measured ANOVA indicated differences. Bonferroni is an appropriate posthoc when sphericity is not assumed (Field, 2009). From the posthoc analysis, it was found Exam 1 scores differed with Exams 2 and 3. Exam 2 scores differed with Exams 1 and 5. Exam 3 scores differed with Exams 1 and 5. Exam 5 scores differed with Exams 2 and 3. Table 3 summarizes the findings. Therefore, in the incidence of Exam 2 and 1 the null hypothesis was rejected, in the incidence of Exam 2 and 5 the null hypothesis was rejected and in the incidence of Exam 2 and 3 the null hypothesis was accepted.

When investigating perceptions regarding the use of the crib sheet, means and standard deviations were calculated and summarized in Table 4. The students in the sample agreed the crib sheet was useful, indicated by their disagreement with the statement, I did not find the crib sheet useful (M = 1.57, SD = .72). More specifically, they agreed the crib sheet helped them to retain course information (M = 3.80, SD = .78), their stress levels were lower during exams utilizing the crib sheet (M = 4.30, SD = .98), they would prefer to use the crib sheet in all Virology exams (M = 3.96, SD = .99) and in other courses (M = 4.16, SD = .98) and the crib sheet was helpful in reinforcing and remembering course material (M = 3.90, SD = .85) The students in the sample were neutral regarding if they felt they relied on the crib sheet more than they should have during exams (M = 3.12, SD = 1.07) and if they did not use the crib sheet during the exams because the preparation of the sheet helped them to remember (M = 2.86, SD = .94).

Table 4. Means and Standard Deviations Regarding Perceptions of Crib Sheet Use by Students (n = 114)

Item	Mean	SD
My stress levels were lower during exams that allowed the crib sheet.	4.30	.98
I would prefer to use the crib sheet in all of my other courses.	4.16	.98
I would prefer to use the crib sheet for all of my exams in Virology.	3.96	.99
I found the crib sheet was helpful in reinforcing and remembering course material.	3.90	.85
The crib sheet helped me in a way that I feel I will retain the course information longer.	3.80	.78
I relied on using the crib sheet more than I should have during the exams.	3.12	1.07
I did not use the crib sheets during the exam because the preparation of the sheet helped me to remember.	2.86	.94
I did not find the crib sheet useful.	1.57	.72

Note. Scale was: 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree

Discussion

Exams where the use of a crib sheet was permitted (1, 3 and 5) yielded higher average scores than exams where a crib sheet was not permitted (2). This is consistent with Raadt (2012) and Skidmore and Aagaard (2004) who found improvements in exam performance with use of crib sheets. The first and last exam of the semester (1, 5) had the highest averages and both allowed use of crib sheets. Exam 2 had the largest variation of scores out of all five exams, signifying the use of crib sheets may help to reduce exam score variation among students. Exam 3 did utilize a crib sheet; however it was statistically different than the other two Exams with crib sheets (1, 5). Instead Exams 2 and 3 did not differ, despite Exam 2 not utilizing a crib sheet. The low scores for Exam 3 could be due to the placement of the exam during the semester or the content difficulty of the exam. The researchers recommend a future study be conducted taking into account the content difficulty and sequence of exams when determining which will involve crib sheets to eliminate as many confounding variables as possible.

Virology students in the sample agreed their stress levels were lower with exams permitting crib sheets, which echoes the findings of Drake et al. (1997) and Erbe (2007) among others. Considering the academic stress resulting from exams

Table 3. Bonferroni Posthoc Test Analyzing Differences between Exams

(I) Exam	(J) Exam	Mean Difference (I-J)	Std. Error	95% Confidence Interval for Difference	
				Lower Bound	Upper Bound
1	2	6.52*	.78	4.29	8.75
	3	4.69*	.60	2.97	6.41
	5	.71	.55	-.87	2.30
2	1	-6.52*	.78	-8.75	-4.29
	3	-1.83	.77	-4.03	.37
	5	-5.80*	.78	-8.05	-3.56
3	1	-4.69*	.60	-6.41	-2.97
	2	1.83	.77	-.37	4.03
	5	-3.98*	.70	-5.99	-1.96
5	1	-.71	.55	-2.30	.87
	2	5.80*	.78	3.56	8.05
	3	3.98*	.70	1.96	5.99

reported in veterinary medicine students (Williams et al., 2005) this was an encouraging find. The students neither agreed nor disagreed that they did not use the sheet because the preparation helped them to remember the content. This neutral stance could be because the majority of students utilized the crib sheet during the exam regardless of how much the preparation helped or didn't help them to comprehend and retain the material. Students in the sample found the crib sheet useful, which was demonstrated by both their disagreement with the statement: "*I did not find the crib sheet useful and their agreement that the crib sheet was helpful in reinforcing and remembering course material and retaining the course information longer.*" Students were neutral on whether they felt they relied on the crib sheet too much. This could be because some did depend on it instead of learning the material and others used it as a study tool. Another possible explanation could be the students didn't know how much was too much use, therefore more of their perception scores centered on the neutral mark.

Overall, recommendations for practice include implementing crib sheets into more veterinary medicine courses to aid in student learning and achievement and to decrease stress and exam anxiety. With the increasing amount of information students are expected to master (Radostits, 2003) to become successful veterinarians, crib sheets could be one solution to the information demand in a high stakes testing setting. One of the recommendations of the NAVMEC report (2011) is to reduce stress in veterinary medicine students, which has been found by this study and others in various disciplines to occur with crib sheet use. The profession could benefit from additional studies to support these claims by examining various veterinary medicine courses for similar findings. Future research should also examine the long-term effects of exam aids to determine how much knowledge is actually being retained with the use of crib sheets. In addition, to mitigate the fact that students were tested over different content from test to test, a longitudinal approach would be beneficial. The researchers recommend a follow-up study be conducted to compare results of students using a crib sheet for Exam 1 in one year to students not using a crib sheet for Exam 1 in the following year.

Summary

Based upon the findings of this study it can be concluded the use of crib sheets in veterinary medicine education may lead to increased exam scores. Additionally, students perceived decreased stress when utilizing crib sheets and indicated crib sheets assisted them in reinforcing and remembering the course material. With the increase in amount of course material veterinary medicine students are expected to master and the pressure of high stakes testing, crib sheets could be the answer to student learning and achievement while continuing to decrease exam anxiety. Future studies in veterinary medicine exploring the long term effects of exam aids to determine actual knowledge retention are encouraged.

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National Survey of Study Abroad Programs Conducted in Asia Using the Food and Agriculture Education Information System (FAEIS) Database[1]

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Abstract

This research is motivated by two factors: (1) the importance of study abroad programs to agricultural students and (2) a need for a reliable, accessible and searchable national database that describes agricultural study abroad programs. Apart from the pedagogical benefits, study abroad experiences enhance job market competency and provide opportunities to increase understanding of different cultures and values. Data from the Food and Agriculture Education Information System international programs' database is used to assess U.S. study abroad programs in Asia. This research validated the data using 783 study abroad programs from 84 different land-grant institutions included in the database. Focusing on U.S. land-grant institutions for the years 2004-2010, 25 operate one or more agriculturally-driven study abroad programs in Asia. Study abroad results show that the most travelled Asian countries are China, India and Russia, focus predominantly on agriculture and are either research-based or teaching-oriented. Educators and universities could use this resource to develop partnerships with other institutions, review the breadth of international study abroad projects and serve as a recruitment tool to quickly identify campus-based experts.

Introduction

The U.S. National Security Act of 1991 tripled federal spending on undergraduate study abroad programs. Similarly, the Act also allows increased spending on graduate research and grants abroad. In April 2000, President Clinton signed a memorandum that doubled the exchange opportunities in U.S. higher education for the following ten years. American higher education has tried to fulfill this challenge in many ways. Some institutions included their goals for international education in campus wide strategic plans, while others incorporated it into individual disciplines (NAFSA: Association of International Educators, 2007).

In the United States, study abroad programs at the university level consist of different types. Some programs may allow students to complete only a portion of their studies outside of their home country, while other programs may require students to complete their entire degree abroad. Study abroad programs also provide internships overseas, or may encourage students to teach in a different country (Landis et al., 2004).

This research is motivated by two factors: (1) the importance of study abroad programs to agricultural students and (2) a need for a reliable, accessible and searchable national database that describes study abroad programs. This research identified the international programs' database within the Food and Agriculture Education Information System (FAEIS) as a unique database that compiles nationwide higher education data for agriculture and life sciences.

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Importance of Study Abroad Programs to Agricultural Students

The United States is the top destination for about three-quarters of prospective students worldwide who want to go abroad for their higher education. Similarly, more than 75% of the prospective students willing to go abroad for studies believe that the U.S. has a variety of programs that would suit individual needs (Chow, 2011). These are the major reasons why the United States is considered an educational hub for students worldwide. This might lead one to wonder why a U.S. student wishes to go abroad for studies.

There is more than one reason why study abroad programs are equally important to U.S. students as they are to any other student in any part of the world. There are many pedagogical benefits of studying abroad (Kleine et al., 2012; Myers et al., 2005; Norris and Dwyer, 2005). Today's job market makes study abroad experiences important. For example, one aspect of globalization is today's diverse work force. For work place harmony and interacting with global customers, individuals need to be respectful of different cultures and values. International exposure helps people become more tolerant to different ideas and appreciative of other opinions (Falk and Kanach, 2006; Norris and Gillespie, 2009; Patterson, 2006; Peacock, 2005). These experiences become relevant to agricultural students, because one in six agricultural jobs today is directly tied to international trade (Bruening and Shao, 2005).

Study abroad programs also bring a different level of maturity to students and help them transform to more appreciative citizens upon their return home. For example, U.S. students studying abroad are also viewed as citizens from a country which has global socio-political impacts. Thus, these students may elicit strong responses in a host country which might help them realize the unique privileges as U.S. citizens (Falk and Kanach, 2006). Earlier research suggests that studying abroad also provides a unique opportunity to discuss sensitive issues that might eventually bring a greater understanding between individuals from different countries (Falk and Kanach, 2006; Ogden, 2007).

Why Asia?

Most of the countries in Asia are agriculture based and are making concerted efforts to improve their agriculture sector. Unfortunately, it is also a region where more than 1.29 billion people live on less than $1.25 USD per day and where food security is always an issue (World Bank, 2005). International rules and regulations impact agriculture in Asia as much as their domestic policies. While these factors make Asian agriculture vulnerable, these are also the reasons which make Asian agriculture interesting from a student's point of view. Asia is also very important to U.S. from a trade point of view. For example, India and China are very influential on international trade related agricultural policy development. More recently, China has emerged as a major trading partner for the United States.

Second language proficiency is an important achievement today in the context of globalization. Asian countries are non-English speaking countries. So, if a U.S. student chooses an Asian country over any English speaking country, an added advantage is an opportunity to learn a new language. Additionally, educators and the U.S. government alike have recognized the importance of studying abroad in a non-English speaking country (Curran, 2007; Stearns, 2009). These facts make it very likely that Asia will surpass Europe as the most visited region by U.S. students for future study abroad purposes.

Research Objectives

The goal of this research is to communicate the existence of a reliable, accessible and searchable national database describing study abroad programs and to use it to research U.S. agriculturally-driven study abroad programs. Therefore the specific objectives of this research are to describe the U.S. study abroad programs in Asia, specifically to identify:

1. Which Asian countries are sites for agriculturally-driven study abroad programs.
2. Which higher education institutions are the major operators of Asian study abroad programs for agriculture and life sciences.
3. Which area receives priority for study abroad programs among the four major disciplines in agriculture and life sciences—(1) agriculture; (2) family and consumer sciences and human sciences; (3) forestry and natural resources; and (4) veterinary medicine.

Methods

Good data are the first step toward successful research and related statistical inference. Currently, research on study abroad programs cite inadequate data as a research limitation (Engle and Engle, 2003; Gerald et al., 2009; Patterson, 2006; Yao, 2009). A reliable, accessible and searchable database and the common knowledge of its existence would help overcome this problem.

Selection of Database

A database helps a researcher comprehend the benefits of the programs based on objective criteria, such as length of program, field exposure and new techniques. Research that evaluates the benefits of a study abroad program exists. However, most are of qualitative nature, either because there is dearth of data or because there is no clear cut distinction of various kinds of study abroad programs.

The Food and Agriculture Education Information System is a project developed by the United States Department of Agriculture (USDA) in 1983. Since 2002, the FAEIS database has been managed by Virginia Tech (VT) (FAEIS website; Marchant et al., 2010). In 2006, the higher education community and the USDA-National

Institute of Food and Agriculture (NIFA), realized the need for data on study abroad programs. It was agreed that a project database rather than an individual database would better serve the need to develop international programs partnerships with universities. At the request of the higher education community and the USDA-NIFA, FAEIS developed an international programs' database (IPD) in 2008. The objective of IPD is to promote global initiatives in higher education and recognize international accomplishments for both the institution and faculty. The database is the first national database to include information on students studying abroad, international research, teaching and outreach projects and countries with international projects. In the initial years the database demonstrated that maintaining these information in a systematic manner in one place was feasible.

"*Following the formation of the FAEIS International programs' database, the Association of Public and Land Grant Universities (APLU) started to collect similar information for both agriculture and non-agricultural colleges and universities but later it was discontinued*."—(Richardson, 2013)

This research finds FAEIS IPD to be more focused on agriculture and more complete and current compared to the APLU data for land grant colleges and universities. Another distinct advantage is the elaborate features included in the IPD database which makes it searchable and easily accessible to a researcher. Importantly, this research identifies FAEIS IPD as a unique web-based, searchable national database on study abroad programs with an agricultural focus. Thus, FAEIS IPD is unique.

FAEIS is a self-reporting database and this fact might elicit concerns. For example, concerns might be that the information might be inaccurate or that institutions might be unwilling to report their true data (Fixsen et al., 1972; Fowler, 2009). The FAEIS IPD in most cases invites partner universities to complete the survey questionnaire accessible online to share their data. Thus data comes from an accountable and reliable source. When partner universities cannot directly fill in the survey, the FAEIS team uses data that are published in other sources. If some anomalies are found at the end of a reporting year, the FAEIS team sends out a combined report to university and college administrators. This report allows the institution final approval prior to the data being made public. This makes the FAEIS database reliable.

What Makes the FAEIS IPD a Good Database for U.S. Study Abroad Programs?

1. The Database has Hierarchical Classification of Study Abroad Programs

Length of a program and its availability at a given time is a valuable piece of information to any scholar willing to pursue studies abroad. For example, some researchers might be interested in a month long field exposure or while another might be interested in a yearlong degree program. The FAEIS International programs' database includes information on length of study abroad programs for land grant colleges and universities.

2. The Database has categorized Study Abroad Programs Based on Academic Areas

U.S. Study abroad programs related to agriculture and life sciences are distinguished into four types – (1) a*griculture*; (2) f*amily and consumer sciences and human sciences*; (3) f*orestry and natural resources*; and (4) v*eterinary medicine.* This classification is consistent with the disciplines in colleges of agriculture and life sciences for most of the land grant universities in the United States. This type of distinction makes comparison of study abroad programs across universities easier.

3. The Database has Differentiated Study Abroad Programs Based on the Nature of the Program

The nature of study abroad program refers to whether a program is research based, outreach oriented, training related or an instruction endeavor or any mix of these types. This differentiation is important because merits of a study abroad program can be comparable only among programs of similar nature.

4. The Database has Listed Objectives of a Study Abroad Program

Most useful data is well described data. For example, having information on specific objectives of a program, one could easily identify the program best suited to one's needs. Importantly, this also provides criteria for judging the benefit from a specific study abroad program.

5. The Database also has Information on Participating Institutions for Study Abroad Programs

This is important for many different reasons. For example, it becomes easier to identify experts in a discipline and to assess prospects for future collaboration. The FAEIS IPD also includes information on contact persons for any further information which is helpful when one wants to know specific details of a project.

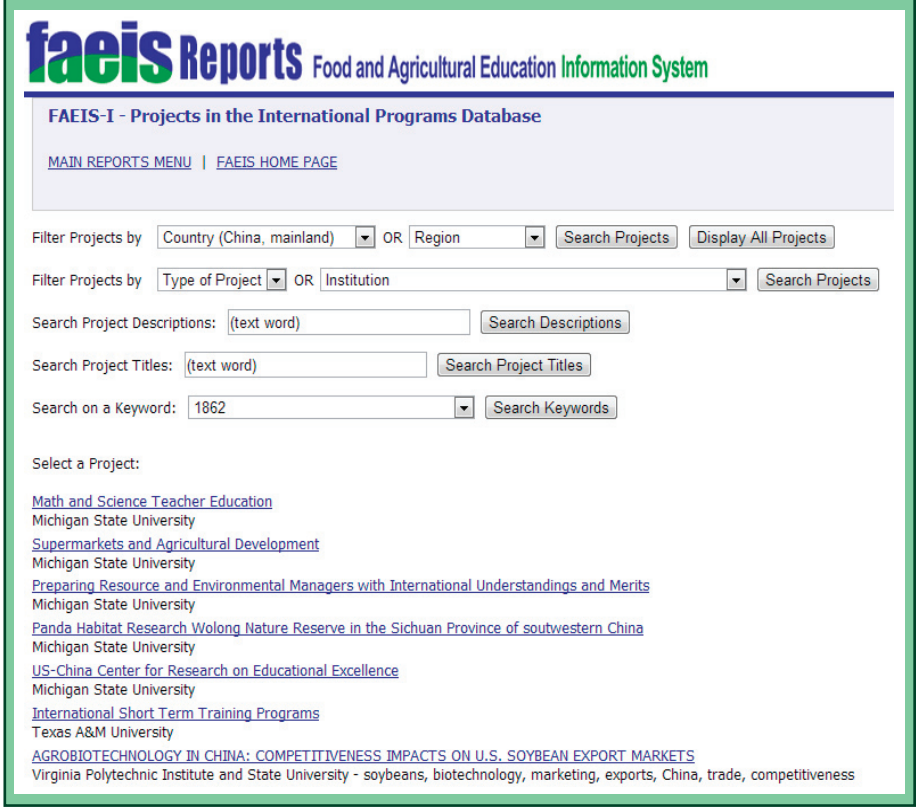
6. The database is searchable, reliable and accessible

The FAEIS IPD is searchable by different parameters –study abroad programs, participating institutions, nature of the program and country or region. This eases the use of the database. Additionally, the database was designed by a panel of experts, extensively discussed at the Association of Public and Land-grant Universities (APLU) meetings and alpha and beta-tested with 18 institutions. The FAEIS database is accessible via internet as described above. The FAEIS team is willing to answer specific questions related to the use of the database.

Exploring the FAEIS International Programs' Database

The FAEIS IPD for higher education can be accessed at http://www.faeis.ahnrit.vt.edu/ipd.shtml. This database provides information on international projects, primary contacts for such international projects, faculty members with expertise on such projects, partner institutions and the number of students studying abroad. The link

Figure 1. Screen Shot of the FAEIS International programs' database Webpage (http://faeis.ag.vt.edu/REPORTS.cfm?S=5)



"http://faeis.ag.vt.edu/REPORTS.cfm?S=5" leads to the following window as shown in figure 1. There, one can set filters for projects by type of the project (research, instruction and outreach), institutions, country and region. FAEIS Report Builder (http://faeis.ag.vt.edu/faeisrpt.cfm) is another useful tool for generating custom reports. The first step is to use the link and get a temporary FAEIS ID and a password.

Research Design

This research uses data retrieved from the Food and Agriculture Education Information System IPD to examine agriculturally-driven U.S. study abroad programs in Asia for the years 2004 through 2010. This research focuses on 109 land-grant colleges and universities in the United States: 59 historical 1862 land grants, 18 African American 1890 land grants and 32 tribal 1994 land grants. Agriculturally-driven academic programs in the United States reside in colleges of agriculture and life sciences. The four major disciplines in the colleges across the land grant universities are (1) agriculture; (2) family and consumer sciences and human sciences; (3) forestry and natural resources; and (4) veterinary medicine. Examples of programs in each of these include, respectively, agriculture economics, entomology, animal science; food science and technology, family and consumer science, early childhood education; forest resources and environmental conservation, natural resource economics, fishing and fisheries sciences and management; veterinary anatomy, veterinary biomedical and clinical sciences, animal health technology.

Data Collection and Analysis

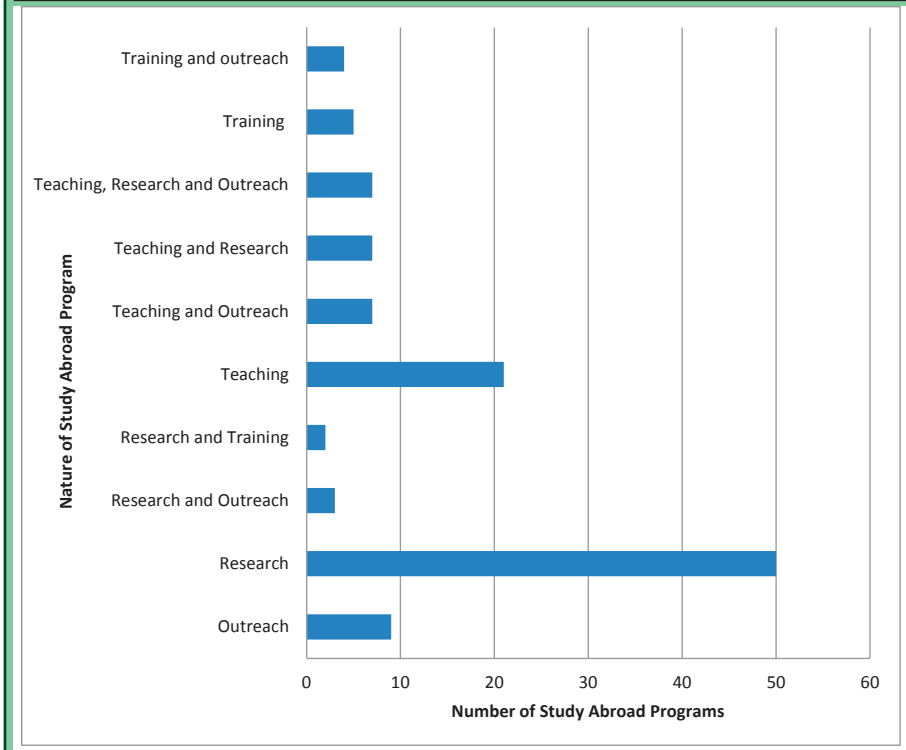
This research considers 1862, 1890 and 1994 land grant colleges and universities for agriculturally-driven U.S. study abroad programs to Asia. For this purpose, data on study abroad were collected for all countries in Asia from the FAEIS IPD. Data were tabulated and categorized into FAEIS program areas, nature of the program, university conducting the program and the academic year in which the program took place. Then the data were cross validated using these categories. For example, an individual country was searched for all the study abroad programs by type of project- teaching, research or outreach using the filters in the report builder in the database. To ensure each project was classified correctly, an individual project description available in the database was studied. Then various other filters, namely- institution, country, keyword, year were used to corroborate project type, program country and home university conducting the study abroad programs. Additionally, cross validation went beyond the FAEIS database. Given an individual project in FAEIS, the project completion date and the program area were validated using various online search engines.

This research validated the data obtained using 783 study abroad programs from different land-grant institutions for 2004-2010 that are included in the FAEIS IPD. The variables for this research are the nature of the program, academic year in which the program took place and university conducting the program. Data on study abroad programs in a country tend to be rather unique and therefore presents a greater scope for descriptive analysis than inferential analysis. Hence, descriptive statistical tools were used for the data analysis. Frequency analysis, cumulative frequency analysis and tables and figures were used for summarizing the results.

Results and Discussion

There are 109 land grant colleges and universities in the United States, which include historical 1862, African American 1890 and tribal 1994 institutions. Of these, 84 have at least one study abroad program and 25 operate one or more agriculturally-driven study abroad programs in Asia. Altogether there are 115 distinct agriculturally-driven U.S. study abroad programs in Asia. The majority of the study abroad programs either focus on research (43%) or on teaching (18.3%) (Figure 2).

Figure 2. Nature of the US-Based Study Abroad Programs in Asia



Objective1

Identify Which Asian Countries are Sites for Agriculturally-Driven Study Abroad Programs

The U.S. based agriculturally-driven study abroad programs visited 30 different countries in Asia. The ten most frequently visited countries are listed in Table 1. China has the highest number of Asian study abroad programs (n=20) followed by India (n=15) and Russia (n=12). Among the four academic areas of FAEIS, the programs in China focus predominantly on agriculture and involve teaching and research.

Objective 2

Identify Which Higher Education Institutions are the Major Operators of Asian Study Abroad Programs for Agriculture and Life Sciences

The results show that Michigan State University is the major operator of study abroad programs in Asia. Out of the total 115 agriculturally-driven study abroad programs in Asia, 51 programs are conducted by Michigan State University and Texas A&M University ranks second with 11 programs. Half of the 25 universities operate only one program in Asia (Table 2).

Michigan State University also operates a majority of its agriculturally-driven study abroad programs in China. For example, there are nine universities operating 20 different programs in China and 12 of them are conducted by Michigan State University (Table 3).

Examples of study abroad programs led by Michigan State University include the role of third party certification for food safety in China, partnerships for international research and education program: new generation synthetic membranes - nanotechnology for drinking water safely in Russia, strengthening institutions for investment climate and competitiveness in Philippines, food policy support in Indonesia.

Objective 3

Identify Which Area Receives Priority for Study Abroad Programs among the Four Major Disciplines in Agriculture and Life Sciences—(1) Agriculture; (2) Family and Consumer Sciences and Human Sciences; (3) Forestry and Natural Resources; and (4) Veterinary Medicine

Among the four program areas of FAEIS, agriculture receives the highest priority for study abroad programs. Forty-three of the total agriculturally-driven study abroad programs solely focus on agriculture, while a discipline like veterinary medicine has very few U.S. study abroad programs in Asia (Table 4). Eight programs in India and six programs in China focus solely on agriculture. Although China was the top destination for all agriculturally-driven study abroad programs, when disaggregated by discipline, India was the top destination for agriculture. Other agriculturally-driven U.S. study abroad programs in China are forestry and natural resource (4); family and consumer sciences and human sciences (6); and interdisciplinary agriculture sciences, programs that involve more than one of the above disciplines (4). Veterinary medicine does not have U.S. study abroad programs in China (Table 5).

Table 1. Top 10 Most Frequently Visited Countries in Asia for Agriculture Based U.S. Study Abroad Programs During 2004-2010

Year	Country	Agriculture[1]	Human Science[2]	Natural Resource[3]	Veterinary medicine	Interdisciplinary[4]	Totals
2005-2010	CHINA	6	6	4		4	20
2005-2010	INDIA	8	5	1		1	15
2005-2010	RUSSIA	4	3	2	1	2	12
2005-2009	INDONESIA	2	1		2	2	7
2005-2009	PHILLIPPINES	2	1	2		1	6
2004-2010	AFGHANISTAN	2	1			2	5
2007-2009	IRAQ	3				2	5
2005-2009	JAPAN	2	3				5
2005-2010	NEPAL		2	1	1		4
2005-2010	THAILAND	1	2			1	4

[1]Agriculture = Agriculture and life sciences
[2]Human Science = Family and consumer sciences and human sciences
[3]Natural Resource = Forestry and natural resources
[4]Interdisciplinary = Interdisciplinary agriculture sciences

Summary

The FAEIS International programs' database promotes global initiatives in higher education and recognizes international accomplishments for both the institution and faculty. Agriculturally-driven study abroad programs in the United States visit a wide range of countries in Asia. The most travelled Asian countries are China, India and Russia. Among the four program areas of FAEIS, the U.S. study abroad programs in Asia focus predominantly on agriculture and are either research-based or teaching-oriented. Such agriculture related study abroad programs are mostly conducted in India, China and Iraq. Among the land grant colleges and universities, Michigan State University operates most of these study abroad programs in Asia. To conclude, FAEIS IPD is a resource that can be used to develop partnerships with other institutions; review the breadth of international projects; and serve as a recruitment tool to quickly identify campus-based experts who could serve on international projects.

Table 2. Number of Study Abroad Programs Led in Asia by U.S. Land Grant Colleges and Universities During 2004-2010

University	Number of Study Abroad Programs
Michigan State University	51
Texas A&M University	11
University of Maryland	8
Purdue University	7
Virginia Tech	5
University of Delaware	4
University of Kentucky	3
North Carolina State University at Raleigh	3
Tufts University	3
Iowa State University	2
Pennsylvania State University	2
Washington State University	2
West Virginia State University	2
Cornell University	1
Kansas State University	1
Middle Tennessee State University	1
Missouri State University	1
North Carolina Agricultural and Technical State University	1
University of Arkansas at Pine Bluff	1
University of California-Davis	1
University of Florida	1
University of Illinois at Urbana-Champaign	1
University of North Carolina at Greensboro	1
University of North Texas	1
University of Wisconsin-Stevens Point	1
Total =25 universities	115 Study Abroad Programs

Table 4. Study Abroad Programs by Academic Areas During 2004-2010

Program Areas	Number of Study Abroad Programs
Agriculture	43
Family and Consumer Science and Human Science	35
Forestry and Natural Resource	13
Veterinary Medicine	5
Interdisciplinary Sciences	19
TOTAL	115

Table 3. Number of Study Abroad Programs Led by U.S. Land Grant Colleges and Universities in Different Asian Countries During 2004-2010

Country	Number of Study Abroad Programs	University that has Study Abroad Programs
AFGHANISTAN	5	Texas A&M University (3)
		Michigan State University (1)
		Washington State University (1)
BANGLADESH	1	Virginia Tech (1)
CAMBODIA	1	Michigan State University (1)
*CHINA	20	Michigan State University (12)
		Texas A&M University (1)
		Iowa State University (1)
		Missouri State University (1)
		North Carolina State University (1)
		Purdue University (1)
		University of Arkansas at Pine Bluff (1)
		Virginia Tech (1)
		West Virginia University (1)
GEORGIA	3	Texas A&M University (1)
		University of Kentucky (1)
		University of Maryland (1)
HONG KONG	1	University of Delaware (1)
INDIA	15	Michigan State University (9)
		Cornell University (1)
		University of Florida (1)
		Kansas State University (1)
		North Carolina State University at Raleigh (1)
		Purdue University (1)
		University of Wisconsin-Stevens Point (1)
INDONESIA	7	Michigan State University (3)
		Tufts University (2)
		University of Kentucky (1)
		Texas A&M University (1)
IRAQ	5	Texas A&M University (4)
		Washington State University (1)
ISRAEL/PALESTINE	2	Texas A&M University (1)
		Purdue University (1)
JAPAN	5	Michigan State University (2)
		North Carolina State University at Raleigh (1)
		Pennsylvania State University (1)
		West Virginia University (1)
JORDAN	1	Purdue University (1)
KAZAKHSTAN	1	Michigan State University (1)
KOREA	3	Michigan State University (2)
		University of North Texas (1)
KYRGYZSTAN	1	Michigan State University (1)
LEBANON	1	Michigan State University (1)
MALAYSIA	1	Michigan State University (1)
MONGOLIA	1	Middle Tennessee State University (1)
NEPAL	4	Virginia Tech (1)
		Tufts University (1)
		Michigan State University (1)
		University of Delaware (1)
OMAN	2	Virginia Tech (1)
		Purdue University (1)
PAKISTAN	2	Michigan State University (2)
PALESTINIAN TERRITORY	1	Purdue University (1)
PHILIPPINES	6	Michigan State University (5)
		Virginia Tech (1)
RUSSIA	12	Michigan State University (6)
		University of Maryland (5)
		University of North Carolina at Greensboro (1)
TAIWAN	2	University of Illinois at Urbana-Champaign (1)
		University of Maryland (1)
THAILAND	4	University of Kentucky (1)
		Pennsylvania State University (1)
		Iowa State University (1)
		University of Delaware (1)
TURKEY	2	University of Maryland (1)
		North Carolina Agricultural and Technical State University (1)
UZBEKISTAN	1	Michigan State University (1)
UNITED ARAB EMIRATES	2	University of Delaware (1)
		Purdue University (1)
VIETNAM	3	Michigan State University (2)
		University of California-Davis (1)
Total =30 countries	115 study abroad programs	

*Highest number of study abroad programs

Table 5. Program Areas by Country During 2004-2010

Year	Country	Agriculture[1]	Human Science[2]	Natural Resource[3]	Veterinary Medicine	Interdisciplinary[4] Agriculture Sciences	Totals
2004-2010	Afghanistan	2	1			2	5
2005-2009	Bangladesh	1					1
2008-2009	Cambodia	1					1
2005-2010	China	6	6	4		4	20
2005-2009	Georgia	3					3
2010-2010	Hong Kong		1				1
2005-2010	India	8	5	1		1	15
2005-2009	Indonesia	2	1		2	2	7
2007-2009	Iraq	3				2	5
2008-2010	Israel	1				1	2
2005-2009	Japan	2	3				5
2008-2010	Jordan					1	1
2005-2009	Kazakhstan	1					1
2005-2010	Korea		3				3
2005-2009	Kyrgyzstan	1					1
2007-2010	Lebanon		1				1
2008-2009	Malaysia			1			1
2005-2009	Mongolia				1		1
2005-2010	Nepal		2	1	1		4
2006-2009	Oman		2				2
2007-2010	Pakistan		2				2
2008-2010	Palestine					1	1
2005-2009	Philippines	2	1	2		1	6
2005-2010	Russia	4	3	2	1	2	12
2005-2010	Taiwan	1		1			2
2005-2010	Thailand	1	2			1	4
2007-2009	Turkey	2					2
2008-2010	United Arab Emirates		2				2
2005-2009	Uzbekistan	1					1
2006-2009	Vietnam	1		1		1	3
	Total				115 study abroad programs		

[1]Agriculture = Agriculture and life sciences
[2]Human Science = Family and consumer sciences and human sciences
[3]Natural Resource = Forestry and natural resources
[4]Interdisciplinary = Interdisciplinary agriculture sciences

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Narrowing the Gap between Academia and Practice through Agroecology: Designing Education and Planning for Action[1]

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Abstract

The Swedish project Agroecology in Practice" [AGROECOPRAC] has a mission to alleviate poverty in households that depend on small-scale farming systems. The method is to establish agroecology education in farming and food systems that are aligned with challenges in small-scale farming. We recognize overwhelming challenges of low productivity, inadequate inputs, poor equity of food distribution and limitations of market infrastructure that can be overcome by thoughtful applications of appropriate technology, through informed and appropriately trained agricultural stakeholders, including educators. We developed an approach to designing creative education and training for action that integrates farmers' knowledge and practices, development work, extension, education and research using whole-systems approaches from agroecology, with unique applications in universities in Uganda, Ethiopia and Sweden. The approach involves program coordinator workshops, teacher training, coordinator meetings, annual general meetings and short courses to facilitate the establishment introductory courses and MSc programs in agroecology. From participant evaluations we conclude that this approach to planning and implementation is narrowing the gap between academia and practice by fostering shared understandings of small-scale agriculture, introducing new educational methods and promoting communication among stakeholders.

Key words: action research, agroecology, small-scale agriculture, participatory methods, agriculture development

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Introduction

According to World Bank (2007) there are more than 1.5 billion small-scale farms with less than 2 ha of cultivated land, with these farms "the most common form of organization in agriculture, even in industrial countries." Naranjo (2012) presents five mediating factors that describe why small-scale farmers often are caught in a "vicious cycle of poverty, hunger and environmental degradation," including limited access to quality land, lack of control and tenure, limited access to credit, difficulties in allocating labor to family production versus wage earning off the farm and poor access to market infrastructure. Additionally, Altieri and Nichols (2008) claim that research clearly shows small scale farms to be more productive per hectare than large scale farms, due to farmers' understanding of local production resources and striving for production efficiency with internal resources.

This current reality stimulates a challenging question posed by an official from SIDA (Swedish International Development Cooperation Agency): Why are agricultural universities uniquely focused in their research, education and training on large-scale and highly-mechanized farming systems when more than half of the agricultural lands on this planet are in the hands of small-scale farmers and managed by people in poor households who can't afford the inputs needed for a high-tech farming system?

Mainstream agricultural education programs have been designed to: 1) focus on large scale industrialized farming systems demanding amounts of fossil fuels most peasants cannot afford; 2) present specialized courses where students' knowledge and skills are narrowly concentrated on some components of a farming system; and 3) build on a mechanistic worldview and deliver lectures, problems and/or case-studies where there is a correct answer already decided by the teacher. Such programs may not prepare graduates well for future challenges, where many problems are complex, context-dependent and multifaceted with several potential solutions.

As a response to this situation a SIDA-financed training and education project Agroecology in Practice (AGROECOPRAC) has the objective to support poverty alleviation for rural households based on their small-scale farming systems. The Swedish University of Agricultural Sciences (SLU) in collaboration with Mekelle University (MU), Ethiopia and Uganda Martyrs University (UMU) hosts the program. These two African universities were chosen because of an expressed interest from well-trained instructors ready to initiate Master of Science (MSc) degree programs in agroecology and agreement from administrators that there would be institutional support for such an initiative. The general vision in the project was to establish an action-orientated, interdisciplinary education and training program that integrates farmers' practices, development work, extension, education and research using the platform of agroecology as 'ecology of food systems' (Francis et al., 2003). The long-term, continuing objective has been to support poverty alleviation for households based on small-scale farming systems.

One shared long-term goal in these universities is to establish a cadre of well-educated and practice-oriented agroecologists who understand the challenges of small-scale farmers. In this paper we discuss the approach used to successfully establish practical and relevant agroecology MSc programs and introductory courses in Ethiopia, Uganda and Sweden. We strive to answer this question: Did the approach used in the development project AGROECOPRAC result in successful interdisciplinary educational programs that are action-orientated, have incorporated experiential learning, with competent teachers running them, that can help narrow the gap between academia and practice especially as related to small-scale farmers and agriculture? We describe five steps in this process and an evaluation of each, with the goal of providing guidelines to others who plan to design programs with similar objectives.

Methods

The overall strategy used to design courses and to integrate them into a coherent MSc degree program in each university includes participatory learning for responsible action (Lieblein and Francis, 2007), using open-ended cases in the field (Francis et al., 2009) and applications of ecological principles such as local adaptation and uniqueness of location in design of farming systems (Altieri, 1983; Gliessman, 2007). In keeping with the fundamentals of agroecology, each university program was designed for the agroecoregion in which education takes place and for the conditions where graduates are most likely to do future research and education. Formative evaluation was done through surveys and participatory evaluation methods with instructors, students and other stakeholders to evaluate and adjust the design process as measured by survey results and observations. These are reinforced by quotes from instructors implementing the program. Such results on both content and specific methods for learning were used in an ongoing way to inform the steps in the design process:

Overall Coordination of the Program

Startup Workshops – We followed the principles of participatory and collaborative decision making that would lead to identifying: 1) what important thematic areas should be included in a master program, based on how the experienced teachers defined the most important knowledge, skills and attitudes of a person who would graduate with the MSc degree in Agroecology and then begin professional activities in the field and 2) how a pedagogy of experiential learning working with farmers on their farms using an "open-ended case" approach to learning could be applied to building capacity of graduates to work successfully in their future careers in communication with farmers and other stakeholders.

Coordinators Meetings – These were scheduled regularly to promote close collaboration among the planners from the participating universities and assure that the group was pursuing common goals, finding creative ways to integrate agroecology into each university and clarifying financial and administrative project matters.

Workshops for Evaluation and Quality Control – These involved building consensus on necessary qualifications, methods of achieving goals and assessing progress of new programs for Master thesis students.

2. Training of Teachers (ToT) to develop a solid basis for understanding and teaching systemic approaches to study of farming systems. This included activities in the field in order to experience and further explore the holistic and detailed knowledge of farmers and to learn how to practice participatory approaches and methods with students.

3. Annual general meetings to agree on steps to implement the SIDA project. Participants met to assure that designed courses and the overall strategy was coherent and appropriate to meet the local goals and needs of students in the participating universities and to collaboratively develop the design and contents of locally adapted program and courses.

4. Short courses with stakeholders were designed to create awareness among other agricultural stakeholders at all levels to show how agroecology strives for a holistic understanding and the complexity in agriculture, including challenges at all levels in society, as well as, to provide a continuing orientation and education for the teachers who were learning to bridge the academia – practice gap.

5. Conference for stakeholders and universities was a meeting designed to present agroecology as an approach to agricultural development, the MSc education and the competence of MSc graduates to relevant stakeholders and to extend the concepts and approach to other universities potentially interested in starting their own programs.

Important to all activities in the program was promotion of systems thinking, experiential learning, integration of enterprises, dependence on local resources, emphasis on local food systems and sincere attitudes of participation with farmer stakeholders. Participatory and Action Learning approaches (Marquardt and Waddill, 2004; Narayanasamy, 2009) have helped participating farmers incorporate perspectives on their own farms and advisors to better understand the context where their clients are operating. Agroecologists must approach farmers with humility and willingness to learn in the field. As instructors, we need the same qualities when working with students, farmers and other stakeholders. These same thematic ideas have been used in planning all activities.

Results

Evaluations from meetings and ongoing interactions among instructors in three universities provide insight on how this planning process of collaborative development and introduction of locally adapted educational programs and courses in agroecology is succeeding in bridging the gap between academia and practice. Most results are from the participatory evaluations done at the Annual General Meeting (AGM) in 2012 and from conversations with instructors, students and farmers who have been part of these five activities. As a qualitative case study, the discussion and conclusions are based on both surveys and personal interaction of the authors with participants.

Overall Coordination of the Program

Discussions provided information on the ways that arranged activities of the overall project have contributed to design and conversations have revealed that these meetings were important places for networking, exchanging of experiences and project team building. Discussions also uncovered unique circumstances and challenges that were presented in the three different countries and universities. Participants found these workshops useful in harmonizing multiple understandings of the project focus and scope and helped build the project partnership. The meetings provided a forum to jointly plan the way forward and raised a common awareness of the importance of quality. Among the participants there was a major paradigm shift from the traditional discipline and sector-oriented thinking to a system- thinking approach where the farm is seen as

Table 1. Summary of workshops, annual general meetings, coordinators meetings, trainer courses, short courses, and conferences held in AGROECOPRAC from 2008-2013.

Activities	Year and Location		Number of participants
Start up workshops	2008 SLU 2008 MU		11 40
Annual General Meetings	2009 UMU 2010 SLU 2011 MU 2012 Addis Ababa, Ethiopia		On average yearly: 10 participants / University In connection with Conference
Coordinators meetings	2009 UMU 2010 SLU 2011 MU 2011 MU 2012 MU 2012 Addis Ababa, Ethiopia 2013 SLU		6-7/meeting
Trainer of trainer courses	2009 UMU 2009 UMU 2009 MU 2009 MU 2010 SLU 2012 MU 2013 UMU		Total: 70+ participants Courses at UMU and MU where also open for teachers at SLU.
Short courses	2009 UMU 2010 UMU 2010 MU 2011 UMU 2012 UMU 2013 MU	2 2 2 2 2 1	Total: 161 participants at UMU and 102 at MU Central region Eastern region Tigray area Mbarara region and Fort Portal Northern region Tigray area
Conference	2012 Addis Ababa, Ethiopia		58 Open for politicians, NGOs, other universities
Workshops for improved theses quality	2011 Trelleborg, Sweden 2012 Malmö, Sweden		18 18

part of a large environment with many components that work together for sustainability. This in turn leads to food security and improved incomes.

Training of Teachers

Participants in these courses included more than 70 teachers, who reported on a survey that they were able to broaden their horizons in agriculture through the perspectives of agroecology and become better prepared to think systemically and appreciate the need for experiential learning. Several cited the importance of gaining an in-depth understanding of agroecology and its relationship to Extension and how this could help in improving livelihoods of small rural farmers. Others appreciated learning how agro-ecosystems function, as well as how design of systems impacts their sustainability. The importance of networking was expressed by several colleagues who appreciated the fantastic experience of meeting teachers from SLU, UMU and MU and developing an academic knowledge that is based on shared experiences from other countries. One African instructor orserved that:

"*This was done in my own country, my own village, but I had never visited this particular farmer [and] was surprised by how much knowledge she had. Now the farm is a model for my teaching … I now take students to the farmers not the university farm.*

It has enabled me to bridge theory and practice and it has turned me into a better listener to my students. I now involve my students better in knowledge generation."

These highly impactful comments represent changes in attitude and perception by teachers about their roles in education and how to better involve both farmers and students.

Annual General Meetings [AGM]

Without exception, there were positive answers about the AGM from the 22 respondents to several key questions on an evaluation survey. On average, there was 87% agreement that the project would not have been possible without the AGM meetings. The principal comments from participants emphasized the importance of networking, such as sharing of ideas and experiences, planning for future activities and building a reservoir of knowledge about the participating institutions.

Some of the impacts that were reported included participants' perceptions of the value of all activities and they described how the AGMs served to provide an overview of what has been achieved, while also reviewing the directions and filling identified gaps in the current program. They were focused on finding solutions to project challenges, adjusting and completing the curriculum and integrating evaluation into project activities,

Short Courses with Stakeholders

Over the project period from 2010-2012, there were 224 stakeholders involved in these short courses and there were successful elements that contributed to the implementation of the program and also to ongoing planning of educational activities with students:

At Mekelle University [MU] there were separate short courses designed for farmers and other stakeholders. Observed strengths of this strategy were well-focused training with a high level of interaction among participants, season-appropriate training and participant-accessible training language. Weaknesses included difficulty solving cross cutting issues among stakeholders and gaps in identifying demand-driven research ideas. Praises for the courses included relevance, timeliness, applicability and useful all-round knowledge. Participants would have preferred smaller numbers of trainees in each course and wanted follow up courses to supplement their experiences.

At Uganda Martyrs University [UMU] the short courses were for mixed stakeholder groups. The only weakness expressed by the teachers was how to satisfy all expectations because of diverse participant backgrounds. Strengths observed in courses for mixed stakeholders included sharing diverse experiences and views, highlighting importance of multidisciplinary development approaches and bringing in key players who are important to policy formulation.

The short courses also reached a wide range of stakeholders and helped to bridge gaps and bring the university to the community, while identifying locally relevant content and providing hands-on experience.

The main critiques from the participants were the short duration of the course, desire for more details, limited number of participants and lack of follow up meetings and courses. At SLU in Sweden, no short courses were held.

Conference for Stakeholders and Universities

We asked participants in the conference what activities made the greatest impression on them and specifically: "What do you think is most important for future education to support sustainable development of small-scale farming and small-scale farming's contribution to sustainable development?" Activities mentioned most frequently as making the greatest impact were the presentations done by six MSc students (two per University) of their theses work, noted as valuable (the highest rating) by 14 of the 35 respondents.

Three main areas that were highlighted as most important by the 35 respondents included recommendations to pursue:

1. Social networks that included collaboration and sharing of experiences from three universities with broad participation – including farmers, open dialogue and respect for all ideas generated on the reflections made by different participants;
2. Focus on issues related with sustainability in ecosystems, discussions on systems thinking and relevance of the issues to the current world situation; and
3. Boosting the sustainable agroecological program, introducing ecological principles and knowledge to

improve food production and security and providing good inputs for expanding research activities.

The conference participants also suggested more emphasis on programs to 1) reach different target groups, 2) interaction between theory and practice and 3) increased visibility of the program. For example, the first aspect could be accomplished through providing education for a greater number of students who are from different regions, extending the program to other undergraduates and high school students and including short-term training for different practitioners and particularly for grass-roots level project implementers. This could be completed by organizing workshops and other activities to influence policy makers, strengthening the existing MSc education, opening a PhD program and launching similar programs at other universities. Additional suggestions were introducing short courses in other countries, continuing discussions among teachers and students, promoting mobility and exchange and launching an international agroecology network and international PhD program. To further narrow the gap between theory and practice (2), participants urged more interactions between educators and farmers, including placing agroecology students to live with farming families in rural communities for some time to understand the system. Future educators need to engage smallholder farmers and industry players when identifying problems and this will help to relate agroecology to practice. There was strong concern to keep education multidisciplinary and transdisciplinary and that all education, training and research be focused on participation with deeper collaboration with NGOs. One suggestion to encourage linking of real life experiences to concepts and theory is to integrate small scale farmers into knowledge generation as resource persons and let them guide much of the hands-on experiences of students.

Visibility of the program (3) could be improved by encouraging researchers to channel more results into publications, writing about the best practices on every farm visited to be circulated or put on web site and creating greater awareness among the public, policy makers and NGOs. This can be accomplished by bringing key policy makers into the decision making for education, sharing results of research with those with the need to know and documenting work done so far for the wider community to be informed through appropriate local channels.

Overall reflections from teachers who participated in the courses, workshops, conference and other activities provide a multi-dimensional window on the program and evaluation of instructors, students and farmers experiences working with the MSc program and the introductory courses. They reported in the evaluation a number of on-going challenges as well as joys of working with students in practical agroecology education.

Challenges identified by teachers were inadequate educational resources and internet connections, insufficient institutional support, especially during initial phase and need for more multidisciplinary knowledge and time for teachers to train. They recognized the need for time required for thesis supervision, building effective teams and scheduling supervisor meetings. Essential to progress is deciding how to best assess learning and evaluate clarification of attitude. There is still limited time for practical fieldwork and limited mobility funds. Another challenge is balancing different knowledge levels to accommodate all students. There are worries about a discrepancy between agroecological thinking in courses and project work and the ideas that still prevail in government and other organizations. Field experiences often reveal a gap between theory of agroecology and current farmer thinking about practices and systems and this needs to be bridged by participatory demonstrations and other activities jointly planned by all stakeholders. Finally, the time needed for launching a new program especially in meetings with educational administration is generally underestimated.

The positive aspects mentioned by teachers include a renewed focus and motivations for research that is demand driven, highly relevant and contributes to solving real problems of local people. It is stimulating to hear positive student responses such as, “Aha, this is what I am searching for!” Both teachers and students learn that team working can be fun, while also expanding horizons that proves useful for all players. It is also stimulating to further agroecological thinking while learning in collaboration with stakeholders. Co-learning with students brings diversity, spirited discussion and greater student participation with new methods of learning and it is exciting to follow development of students and changes of thinking while they are interactive and motivated in this new learning landscape.

Observations on the Agroecology MSc Program from teachers and some of the 50 students who have completed the two-year study course and thesis include:

- Mekelle University (MU) teachers are pleased with applicant numbers, but hope to accommodate more students in their program because of the large number of applicants. Program content and learning activities have achieved an agro-ecological awareness in students, as demonstrated by highly relevant thesis projects. The program is well integrated in the university but needs more project support. Staff training and student perspectives both need continuing development, with hopes for increased future exchange of students and teachers and south-south initiatives.
- At Uganda Martyrs University (UMU) teachers are impressed with a new program that is attracting students and with how they have gained an agro-ecological perspective in their courses. Integration at university level with other courses has been accomplished and teachers are content with facilities and resources, motivation and capacity building of teachers and student thesis projects.

Instructors express a need for more exchange of students and teachers with other universities.

- Teachers at the Swedish Agricultural University [SLU] are pleased with the course content and feel competent in their abilities to develop an agroecology context that is meaningful for their students. Integration on the Alnarp campus, appropriate facilities and resources, motivation for capacity building among teachers, useful student exchange and good thesis research topics are highlights. An ongoing problem at SLU is attracting students due to admission and tuition changes.
- All three universities report that field trips, farm visits and extension interactions have been valuable for students as core components of courses. Farmers are willing to receive students on a continuing basis and organizations in agriculture find discussions with students to be valuable. This demonstrates achieving the goal of respectful collaboration with stakeholders, a key to successful communication and mutual learning.

Observations on the introductory courses come from teachers who have taught 125 students during 2012:

- At MU experience has shown that more credit hours should be allocated to the course due to level of work. Students appreciated the course relevance and multidisciplinary delivery system; yet provide useful critique about the short course duration and not enough spots for the number of students wanting to take part of the course.
- UMU agroecology teachers have urged their university to institutionalize both introductory and short courses. Students from various disciplines appreciated the concept of agroecology and the power of systems-wide thinking. They recognize the importance of contextualizing knowledge into their disciplines and gaining insight into the M.Sc. agroecology program. Students found the course to be too short.
- At SLU a distance internet course is jointly taught for the past eight years within the network AGROASIS (www.agroasis.org) that involves instructors from four countries. These instructors have underestimated their teaching time in the intense seven-week program each spring term. Facilitators have learned the need for clear instructions and making themselves more available to students in order to facilitate learning.
- In general, students praise good course organization and content that includes systems thinking, Kolb's learning cycle, reflective learning and agroecosystems orientation. The use of e-cases is successful and the main critique has been need for more detailed feedback from teachers.

Discussion

The approach to organizing and implementing this new educational program has promoted local development and continued learning on the subject made possible through facilitating and establishing interdisciplinary contacts as well as cooperation with farmer organizations and local farmers. Instructors found that the planning process and several structured activities facilitated the design of the education through experiential learning, using open cases as a primary approach of working with stakeholders. Both teachers and student participants have been inspired by the process and look at the new methods with open eyes and a renewed energy for learning. Short courses have contributed to openness among all actors in the education arena. The courses have also served as an education for the teachers, giving them new ideas for preparing their own courses within the contexts of their own unique agroecoregions.

Difficulties have included the high costs of transportation of teachers and students to get out of the university to meet the farmers, villagers and representatives of farm organizations. Yet if seen in comparison to the high-cost laboratories and equipment often needed for high-tech science education it is not too expensive. The field trips should be seen as "in real life" laboratories.

It cannot yet be claimed that students have graduated with full knowledge of agroecology and understanding of small-scale farmers' livelihoods, due to the small numbers of graduates surveyed, inadequate for robust statistical analysis of the results. Yet from the evaluation of the conference and participant reports about thesis work in all three universities, we find that instructors and advisors are impressed by the performance of students and graduates after completing the program.

Essential in the approach are systems thinking, experiential learning, integration of enterprises, dependence on local resources, emphasis on local food systems and sincere attitudes of instructors and students toward participation with farmers. These are perspectives and skills that can be learned in class and practiced in the field with farmers and other stakeholders.

Overall organization of the program could not have been accomplished without workshops with stakeholders from all partner universities. One organizer said, "*Workshops were useful in harmonizing our understanding of the project focus and scope. They also build project partnerships, establish implementation plans and help identify all inputs required to start the project.*"

Annual General Meetings were essential to allow all participants to share ideas and experiences, use face-to-face discussions for future planning and assess progress. Other quotes from meeting participants indicated the importance of: filling identified gaps, reviewing our direction, finding solutions to project challenges, evaluating progress toward project goals, completing the curriculum and promoting quality of education. Also important were resolving differences in expectations about handling administrative matters, in selecting content materials of courses and modules, in dealing with different audit systems among universities and in deciding the content of final reports. Creativity is needed to work

within institutional rules to maintain efficient and innovative approaches to agroecology learning. We clearly recognize that it is early in the programs of the three universities to draw definitive conclusions about the effectiveness of this organizational process to arrive at an optimum curriculum and the best courses. Future evaluations of the impacts of the educational strategies and focus on agroecology must solicit responses from graduates in the field, to assess their successes on the job and how the educational program contributed to their capacities to address complexity and change, both characteristics of future farming and food systems that are addressed in study programs in agroecology.

Conclusions

In conclusion we revisit the question: Did the approach used in the development project Agroecology in Practice result in effective educational programs that were designed to be action-oriented, interdisciplinary and with focus on experiential learning? Do these programs have sufficiently high quality content and appropriate activities that will help students who graduate narrow the gap between academia and practice and are there competent teachers designing and implementing the education?

Participatory and Action Learning approaches (Marquardt and Wadwill, 2004; Narayanasamy, 2009) have helped participants understand farmers' perspectives of their own farms. Agroecologists must approach farmers with humility and willingness to learn in the field. As instructors, we need the same qualities when working with students, farmers and other stakeholders as well as when working together developing new educational programs. Through the approach and process used in planning the agroecology educational programs and courses, we were able to develop a common base, but from that foundation each group has built programs that are appropriate to each local context and agroecoregion. The common challenges of instructors could be identified, discussed and resolved without arguments. Similarities in challenges and joys could also be openly discussed, which helps build confidence and ownership in the programs, as well as adding a degree of quality assurance.

"*Having three collaborating universities all committed to the same vision and mission for agroecological education achieved the goal of narrowing the gap between academia and practice,*" said one of the instructors involved from the start of planning. The approaches used have proven highly practical, brought academics together with stakeholders in the farming sector and promoted quality communication based on mutual respect. One challenge is that teachers themselves have engaged in new learning environments quite different from others in their universities and perhaps assumed some degree of "academic risk" for venturing into this new frontier in education.

There has been a high demand for student places in the university programs and demand is further demonstrated by the interest of trainers and farmers for relevant learning activities designed for them. Although there is institutional wariness about this new approach to education, we conclude that most barriers can be overcome and that the agroecology and integrated systems approach has a high level of relevance in today's complex arena of agriculture and food system development. We anticipate that final stages of planning the program and further evaluation and analyses will further substantiate that this approach will have lasting impact on agricultural education based on positive experiences in Ethiopia, Uganda and Sweden.

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A Comparison of Student and Professor Perceptions of Teacher Immediacy Behaviors in Large Agricultural Classrooms

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Abstract

The purpose of this study was to examine student and professor perceptions of teachers' use of immediacy behaviors in large college of agriculture classrooms. A convenience sample of 555 students and eight professors were surveyed. Students perceived that professors were engaging in the classroom but infrequently initiated one-on-one student interactions. Professors also perceived that they were engaging in the classroom and least frequently initiated one-on-one interactions with individual students. When comparing responses from students and professors, professors perceived they more frequently displayed 21 of the 24 immediacy behaviors than their students perceived. The largest discrepancy was professors perceived that they provide feedback and comments on student work much more often than their students perceived. Professors and students were in agreement that professors frequently use a variety of vocal expressions, use humor, smile at the whole class and have relaxed body positions while teaching. Professors and students were also in agreement that professors infrequently initiate one-on-one interactions with individual students.

Introduction

In recent years great emphasis has been placed on the quality of education that undergraduates receive; many have purported that changes must be made in the American higher education system. The National Research Council (NRC, 2009) indicated that societal issues, including changing climates, energy insecurities, food safety, public health problems and national security are the inheritance of today's college undergraduates. Arum and Roksa (2011) and others have suggested that college graduates are underprepared to meet these challenges. Accordingly, many have proffered learning outcomes in an effort to define standards for success in higher education (e.g. Association of Public and Land-grant Universities, 2009; Association of American Colleges and Universities, 2002; Keeling, 2004; Kellogg Commission, 2001; National Research Council, 2009). However, as Ewell and Wellman (2007) pointed out, success in higher education can be defined in many ways.

In its National Symposium on Postsecondary Student Success, the National Postsecondary Education Cooperative (NPEC) tackled the task of defining undergraduate student success by pinpointing elements that contribute to success (Ewell and Wellman, 2007). As a result, the NPEC posited that educational experiences provided by faculty members are "the single most potent component" contributing to student success (Ewell and Wellman, 2007, p. 5). Similarly, Kuh, Kinzie, Buckley, Bridges and Hayek (2006) reported that prior research has indicated that one of the main predictors of student success has been positive faculty/student interaction. What is more, Komarraju, et al. (2010) suggested that interactions with faculty members, good or bad, can leave a long lasting impression on students. Therefore, an investigation into factors that affect faculty/student interactions is warranted.

Cotten and Wilson (2006) proposed that interactions between students and faculty members can be either formal or informal and can occur in or out of the learning environment. Much of the previous research has investigated informal interactions between faculty and students outside of the classroom and shown

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that informal, out-of-class interactions have helped increase students' motivation (Pascarella and Terenzini, 2005); however, fewer studies have investigated the dynamics of student/teacher interactions within the learning environment. According to Velez (2008), one important variable that explains in-class student/teacher interactions has been teacher immediacy.

Literature Review

Teacher immediacy is defined as the verbal and nonverbal behaviors used by teachers that help increase the psychological and/or physical closeness between teachers and students (Christophel, 1990). Examples of verbal immediacy behaviors include, using personal examples in teaching, using humor, calling students by name and praising students' work, while nonverbal behaviors would include, smiling at students, gesturing while teaching, moving about the classroom and having a relaxed body position while teaching. Prior research on teacher immediacy, which has mostly been conducted in the area of communication education, has shown that the use of verbal and nonverbal immediacy behaviors by teachers has been positively related to student motivation (Chesebro and McCroskey, 2001; Christophel, 1990; Christophel and Gorham, 1995), student affect toward learning (Chesebro, 2003; Chesebro and McCroskey, 2001; Christensen and Menzel, 1998), behavior (Christensen and Menzel, 1998), cognitive learning (Chesebro and McCroskey, 2001; Goodboy, et al., 2009) and achievement (Wilson and Locker Jr., 2008).

More specific to agricultural education, Velez and colleagues (Velez, 2008; Velez and Cano, 2008; Velez and Cano, 2011) examined teacher immediacy in relation to motivational processes. In his doctoral dissertation, Velez (2008) investigated the relationships between immediacy and self-efficacy and task-value motivation. He found that verbal immediacy had a low positive association with self-efficacy and task-value motivation. Results also revealed that nonverbal immediacy had moderate positive correlations with self-efficacy and low positive correlations with task-value motivation. Likewise, Velez and Cano (2008) found similar results. They discovered that nonverbal immediacy had a significant, positive relationship with expectancy-value motivation, with a slightly smaller positive relationship between verbal immediacy and expectancy-value motivation. Velez and Cano (2011) examined teacher immediacy in relation to classroom, student and instructor variables among college of agriculture students at The Ohio State University. They found that students enrolled in elective courses perceived their instructors to exhibit more verbal and nonverbal immediacy behaviors than students in non-elective courses. Additional results showed that verbal immediacy was rated the highest in classes of 0-29 students and that immediacy decreased as class size increased. What is more, Velez and Cano (2011) found that students reported greater immediacy behavior use from older instructors and female instructors.

Additional research investigating the use of teacher immediacy behaviors in agricultural education has been conducted by Estepp and associates (Estepp, 2012; Estepp and Roberts, 2013; Estepp et al., 2013; Roberts et al. (2012). Estepp et al. (2013) and Roberts et al. (2012) examined the frequency of verbal and nonverbal immediacy behaviors used by successful instructors in the college of agriculture at the University of Florida. Both studies indicated that instructors who are successful employ a variety of verbal and nonverbal immediacy behaviors during classroom instruction. In a qualitative study by Estepp and Roberts (2013), students in the college of agriculture at the University of Florida were asked to describe behaviors used by instructors that helped the students engage in classroom learning. One emergent theme in the study was teacher immediacy. The participants in the study indicated that when teachers utilized immediacy behaviors, they were more prone be engaged in the classroom. Similar to the work by Velez (2008), Estepp (2012) examined immediacy in relation to motivation in large college of agriculture classrooms. He found positive relationships between immediacy and motivation and engagement. Moreover, Estepp (2012) found that verbal immediacy was a significant predictor of students' values/goal motivation, cognitive/metacognitive strategy use and change in student expectancy for success and values/goal motivation. Likewise, nonverbal immediacy was found to be a significant predictor of changes in students' expectancy for success, values/goal motivation and changes in resource management strategy use. Another finding by Estepp (2012) was that teacher immediacy and professor/student rapport were highly related and that rapport greatly increased the amount of variance accounted for in motivation and engagement.

While prior research has illustrated the benefits of teacher immediacy, most studies have focused solely on students' perceptions of teachers' immediacy use. Jensen (1999) purported that immediacy use by teachers can be a powerful tool, but that many teachers do not possess knowledge of how to properly use immediacy behaviors. Consequently, an investigation into teachers' perceptions of their own immediacy might provide insight into how to help teachers better utilize these behaviors.

Raviv et al. (1990) posited that in classroom settings teachers' and students' perceptions of classroom activities will differ. Theoretically, each individual in the classroom will form their perceptions based on their prior experiences (Dewey, 1938). Raviv et al. (1990) suggested that the perceptions of the teacher should determine the direction of teaching and learning in the classroom. However, a student's perception of classroom activities will determine how they engage in the classroom (Ormrod, 2008). As a result, Raviv et al. (1990) recommended examining both student and teacher perceptions as a matter of practical and theoretical significance.

Gorham and Zakahi (1990) investigated students' and teachers' perceptions of the teachers' immediacy behaviors and found that students and teachers generally agreed on the immediacy behaviors used by the teachers. However, specific immediacy items that had the lowest correlations between student and teacher responses were: (a) looks at the class while talking; (b) uses monotone/dull voice while talking to class; (c) has a very relaxed body position while talking to the class; (d) has initiated conversations with me before, after, or outside of class (teacher version: I have initiated conversations with all or most of my students before, after, or outside of class); (e) will have discussions about things unrelated to class with individual students or with the class as a whole; (f) asks how students feel about an assignment, due date, or discussion topic; and (g) uses personal examples or talks about experiences she/he has had outside of class. While the instructors and students in Gorham and Zakahi's study generally agreed on the immediacy behaviors used, the instructors tended to rate their use of almost every verbal and nonverbal immediacy behavior higher than did the students.

A similar study conducted by Martin (1994) found that students' and teachers' perceptions of immediacy use by the instructors differed and that instructors rated themselves higher in immediacy than did students. Additionally, Martin found that both students' and teachers' perceptions of immediacy behavior use increased throughout the course of the semester.

Furthermore, prior studies by Whittington and colleagues (Whittington, 1995; Whittington and Newcomb, 1993) have shown that in college of agriculture classrooms, instructors' perceptions of their teaching behaviors may not always match their actions. Whittington and Newcomb (1993) found that instructors in a college of agriculture reportedly aspired to teach at high cognitive levels, while classroom observations revealed them teaching at much lower levels. Moreover, Whittington (1995) found similar results among college of agriculture instructors at the University of Idaho.

Purpose

The National Research Agenda of the American Association for Agricultural Education (Doerfert, 2011) stressed the need to examine teaching and learning in agricultural education, broadly defined. More specifically, priority four of the research agenda addressed the need for meaningful and engaged learners. An important aspect of teaching and learning that might affect student motivation and engagement is the interpersonal interaction that takes place between teachers and students in the classroom and perceptions of teacher immediacy behavior use is one way to examine these interactions. Therefore, the purpose of this study was to examine student and professor perceptions of teachers' use of immediacy behaviors in large college of agriculture classrooms and determine what discrepancies in perceptions about teacher immediacy behavior use exist between teachers and students. The following research objectives guided this study:

1. Determine students' perceptions of the occurrence of immediacy behaviors used by instructors,
2. Determine instructors' perceptions of the occurrence of their own immediacy behaviors and
3. Compare student perceptions to professor perceptions of immediacy behavior occurrence.

Methods

This descriptive study utilized a convenience sample from ten large classes in the College of Agricultural and Life Sciences at the University of Florida during the fall 2011 semester. Large classes were defined as classes containing 50 to 100 students. Friedel (2006) reported that no standardized definitions of class size exist, but that prior studies have considered classes with over 50 students to be large.

Upon approval of the University of Florida's Institutional Review Board, instructors of classes that met the criteria were contacted about participating in the study and eight instructors accepted; two of the instructors allowed two of their classes to participate in the study. A total of 555 students and 8 instructors participated in the study. All participants were provided written informed consent prior to participation in the study.

The Immediacy Behavior Scale (Christophel, 1990) was used to collect the data. The instrument was administered to students in each of the ten classes. Additionally, the instructor of each class completed a modified online version of the Immediacy Behavior Scale following the students' administration. The Immediacy Behavior Scale is a 34 item Likert-type scale that measures students' perceptions of the frequency of verbal and nonverbal immediacy behaviors used by their instructor. The scale ranges from 1 to 5 with, 1 = never; 2 = rarely; 3 = occasionally; 4 = often; and 5 = very often. Post-hoc reliability for internal consistency of the items was tested using Cronbach's Alpha and the instrument was found to have an acceptable reliability (α = .86).

For objectives one and two, data were analyzed by calculating the frequencies of student and instructor responses for each of the immediacy behaviors. To accomplish objective three, the Borich Needs Assessment Model (Borich, 1980) was used to calculate the discrepancies between student and instructor responses. Typically the Borich model is used in educational settings to calculate mean weighted discrepancy scores between teachers' perceived competencies in certain skills and their perceived relevance of those skills to aid in the design of professional development. However, Borich (1980) indicated that the needs assessment model can also be utilized to calculate discrepancy scores between supervisors and employees. Therefore, for the purpose of this study, the researchers determined that an examination of the differences in student and teacher perceptions of teacher immediacy was an appropriate use

of the model (Borich, G.D., personal communication, May 4, 2012).

According to the Borich (1980) methodology, student data was separated by class and class means were calculated for each item. The class' mean for each item was then subtracted from the corresponding instructor's response for the item. The difference was multiplied by the mean of the instructors' responses for that item to get the discrepancy score. A separate discrepancy score was calculated for each instructor on each item and lastly, each discrepancy score for a particular item was averaged to get the final mean weighted discrepancy score (MWDS) for the item. A positive MWDS indicated that the instructors rated themselves higher on that particular item, while the value of the MWDS indicates the magnitude of the discrepancy. Borich did not assign any particular value system to MWDS strengths, but indicated that discrepancy scores will vary depending upon the average of the responses. Once the MWDS were calculated, they were ranked in order of magnitude.

Table 1. Student Perceptions of Occurrence of Teacher Immediacy Behaviors (n = 555)

Immediacy Behavior	Occurrence of Immediacy Behaviors (%)				
	Never	Rarely	Occasionally	Often	Very Often
Looks at the class while talking	.4	.2	1.1	10.6	87.7
Asks questions or encourages students to talk	.2	2.5	8.5	22.5	66.3
Smiles at the class while talking	0	2.0	8.1	25.5	64.4
Uses personal examples or talks about experiences she/he has had outside of class	0	.5	8.6	29.9	60.9
Uses a variety of vocal expressions when talking to the class	1.3	6.5	15.0	27.6	49.7
Has a very relaxed body position while talking to the class	1.1	1.3	10.6	37.9	49.1
Gestures while talking to the class	1.3	4.7	13.5	32.9	47.7
Addresses students by name	4.3	13.9	18.8	18.3	44.7
Moves around the classroom while teaching	3.6	10.1	22.1	21.5	42.7
Uses humor in class	.2	2.3	15.8	39.0	42.6
Invites students to telephone or meet with him/her outside of class if they have questions or want to discuss something	5.0	6.8	18.2	32.6	37.3
Asks questions to solicit viewpoints or opinions	1.6	12.2	18.9	31.6	35.6
Refers to class as "our" class or what "we" are doing	1.5	3.6	22.4	37.6	34.9
Gets into conversations with individual students before or after class	.7	5.3	25.9	33.4	34.7
Smiles at individual students in the class	4.5	12.7	23.7	24.8	34.4
Praises students' work, actions, or comments	1.3	5.6	23.5	37.7	31.9
Addresses me by name	33.0	16.5	11.1	8.2	31.2
Gets into discussions based on something a student brings up even when this doesn't seem to be part of his/her lecture plan	1.8	11.7	31.0	28.9	26.5
Asks how students feel about an assignment, due date, or discussion topic	5.8	10.9	31.9	31.5	19.9
Provides feedback on my individual work through comments on papers, oral discussions, etc.	16.8	13.0	24.7	27.2	18.3
Is addressed by his/her first name by the students	56.1	12.5	5.6	7.8	18.1
Has initiated conversations with me before, after, or outside of class	31.4	17.2	25.2	10.4	15.9
Will have discussion about things unrelated to class with individual students or with the class as a whole	17.2	36.9	27.7	10.1	8.1
Touches students in the class	67.8	16.8	10.3	2.9	2.2

Results

Objective one was to determine students' perceptions of the occurrence of immediacy behaviors used by instructors. For this objective, students indicated that the most frequently used teacher immediacy behaviors by instructors were: (a) looks at the class while talking, (b) asks questions or encourages students to talk, (c) smiles at the class while talking, (d), uses personal examples or talks about experiences she/he has had outside of class and (e) uses a variety of vocal expressions when talking to the class. Conversely, students perceived that the least frequently used immediacy behaviors by instructors were: (a) provides feedback on my individual work through comments on papers, oral discussions, etc.; (b) is addressed by his/her first name by the students; (c) has initiated conversations with me before, after, or outside of class; (d) will have discussion about things unrelated to class with individual students or with the class as a whole and; (e) touches students in the class. Table 1 shows the percentages of student responses for each of the teacher immediacy behaviors. Several items that were reverse coded were removed, as these items represented the inverse of behaviors already included in the results.

For objective two, which was to determine instructors' perceptions of the occurrence of their own immediacy behavior use, results revealed that instructors perceive they most frequently (a) use personal examples or talk about experiences they have had outside of class, (b) gesture while talking to the class, (c) look at the class while talking, (d) ask questions to solicit viewpoints or opinions and (e) ask questions or encourage students to talk. On the contrary, the least frequently used immediacy behaviors as perceived by instructors were: (a) I will have discussions about things unrelated to class with individual students or with the class as a whole, (b) I am addressed by my first name by the students, (c) I know the names of all my students, (d) I touch students in the class and (e) I have one-on-one conversations with my students. Table 2 presents the percentages of instructor responses of their own immediacy behavior use. Likewise, reverse coded items were removed from the results.

The third objective was to compare student perceptions to professor perceptions. This was accomplished by calculating Mean Weighted Discrepancy Scores (MWDS). As noted previously, positive MWDS indicate that professors rated themselves higher, while negative MWDS indicated that students rated the professor higher. Additionally, the MWDS value indicates the magnitude of the discrepancy between professors' and students' means for each item. Results are presented in Table 3 in order of MWDS values. Professors rated themselves higher on 21 of the 24 behaviors. The largest discrepancies were observed for the following items: (a) provides feedback on my individual work through comments on papers, oral discussions, etc.; (b) will have dis-

cussions about things unrelated to class with individual students or with the class as a whole; (c) moves around the classroom while teaching; (d) gestures while talking to the class; and (e) smiles at individual students in the class.

Professors and students were in close agreement on seven behaviors (MWDS less than .66). These included: (a) uses a variety of vocal expressions when talking to the class; (b) uses humor in class; (c) addresses me by name; (d) has initiated conversations with me before, after, or outside class; (e) has a very relaxed body position while talking to the class; (f) smiles at the class while talking; and (g) looks at the class while talking.

There were four immediacy behaviors that students and professor both agreed that instructors displayed infrequently (means of less than 3.0). These included: (a) touches students in the class (Ms = 1.48; Mp = 2.50); (b) is addressed by his/her first name by the students (Ms = 2.04; Mp = 2.90); (c) addresses me by name (Ms = 2.74; Mp = 2.90); and (d) has initiated conversations with me before, after, or outside class (Ms = 2.56; Mp = 2.70).

Table 2. Professor Perceptions of Occurrence of Teacher Immediacy Behaviors (n = 8)

Immediacy Behavior	Occurrence of Immediacy Behaviors (%)				
	Never	Rarely	Occasionally	Often	Very Often
I use personal examples or talk about experiences I have had outside of class	0	0	0	25.0	75.0
I gesture while talking to the class	0	0	0	25.0	75.0
I look at the class while talking	0	0	0	37.5	62.5
I ask questions to solicit viewpoints or opinions	0	0	25.0	25.0	62.5
I ask questions or encourage students to talk	0	0	0	50.0	50.0
I move around the classroom while teaching	0	0	0	50.0	50.0
I smile at individual students in the class	0	0	37.5	12.5	50.0
I use humor in class	0	0	12.5	50.0	37.5
I invite students to telephone or meet with me outside of class if they have questions or want to discuss something	0	12.5	0	50.0	37.5
I refer to class as “our” class or what “we” are doing	0	0	25.0	37.5	37.5
I smile at the class while talking	0	0	25.0	37.5	37.5
I praises students’ work, actions, or comments	0	0	37.5	25.0	37.5
I provide feedback on individuals’ work through comments on papers, oral discussions, etc.	0	0	12.5	62.5	25.0
I have a very relaxed body position while talking to the class	0	0	12.5	62.5	25.0
I use a variety of vocal expressions when talking to the class	0	0	12.5	62.5	25.0
I ask how students feel about an assignment, due date, or discussion topic	0	12.5	12.5	50.0	25.0
I get into discussions based on something a student brings up even when this doesn’t seem to be part of my lecture plan	0	0	50.0	25.0	25.0
I address students by name	0	12.5	37.5	25.0	25.0
I get into conversations with individual students before or after class	0	0	12.5	75.0	12.5
I will have discussions about things unrelated to class with individual students or with the class as a whole	0	0	50.0	37.5	12.5
I am addressed by my first name by the students	0	62.5	12.5	12.5	12.5
I know the names of all my students	12.5	37.5	37.5	0	12.5
I touch students in the class	25.0	50.0	12.5	0	12.5
I have one-on-one conversations with my students	12.5	37.5	25.0	25.0	0

Table 3. Discrepancies in Professor and Student Perceptions of Immediacy Behavior Occurrence

Item	M_s	M_p	MWDS
Provides feedback on my individual work through comments on papers, oral discussions, etc.	3.12	4.20	4.52
Will have discussions about things unrelated to class with individual students or with the class as a whole.	2.54	3.70	4.30
Moves around the classroom while teaching.	3.86	4.60	3.41
Gestures while talking to the class.	4.13	4.80	3.20
Smiles at individual students in the class.	3.59	4.30	3.06
Asks questions to solicit viewpoints or opinions.	3.76	4.40	2.80
Touches students in the class.	1.48	2.50	2.56
Is addressed by his/her first name by the students.	2.04	2.90	2.50
Asks how students feel about an assignment, due date, or discussion topic.	3.42	4.00	2.31
Uses personal examples or talks about experiences she/he has had outside class.	4.46	4.80	1.62
Invites students to telephone or meet with him/her outside of class if they have questions or want to discuss something.	3.84	4.20	1.53
Praises students’ work, actions, or comments.	3.84	4.20	1.52
Gets into discussions based on something a student brings up even when this doesn’t seem to be part of his/her lecture plan.	3.59	3.90	1.22
Refers to class as “our” class or what “we” are doing.	3.98	4.20	.93
Asks questions or encourages students to talk.	4.43	4.60	.80
Addresses students by name.	3.70	3.90	.77
Gets into conversations with individual students before or after class.	3.92	4.10	.73
Uses a variety of vocal expressions when talking to the class.	4.05	4.20	.64
Uses humor in class.	4.16	4.30	.61
Addresses me by name.	2.74	2.90	.47
Has initiated conversations with me before, after, or outside class.	2.56	2.70	.39
Has a very relaxed body position while talking to the class.	4.28	4.20	-.34
Smiles at the class while talking.	4.44	4.30	-.61
Looks at the class while talking.	4.84	4.70	-.66

Note. M_s = Student Mean; M_p = Professor Mean

Conclusions, Recommendations and Implications

Students perceived that professors used a variety of immediacy behaviors in the classroom (looking at the class, smiling at the class, using personal examples/ experiences and using a variety of vocal expressions). However, students also perceived that professors infrequently initiated one-on-one or relational student interactions (providing feedback on my individual work, being addressed by his/her first name, initiating conversations with individual students and touching students). Similarly, professors perceived that they used various immediacy behaviors in the classroom (using personal examples, gesturing while talking, looking at the class and asking a lot of questions to involve students), while they perceived that they least frequently initiated relational, one-on-one interactions with individual students (having one-on-one conversations, being addressed by their first names, knowing the names of their students and touching students).

The results of this study revealed differences between student and professor perceptions of immediacy behaviors exhibited by professors in larger classes. Professors perceived they were displaying 21 of the 24 immediacy behaviors more frequently than their students indicated. The largest discrepancy between professors' and students' perceptions was professors perceived that they provide more feedback and comments on student work than students perceived. The second largest discrepancy was that professors more frequently indicated that they have discussions about topics unrelated to class. Other immediacy behaviors with larger discrepancies were for nonverbal behaviors related to classroom interactions (moving around the classroom, gesturing and smiling at individual students). Professors and students were in agreement that professors frequently use a variety of vocal expressions, use humor, smile at the whole class and have relaxed body positions while teaching. Professors and students were also in agreement that professors infrequently initiate one-on-one interactions with individual students (touching students, being addressed by their first names, calling on students by name and initiating conversations with individual students).

The findings of this study are congruent with findings by Estepp et al. (2013) and Roberts et al. (2012). Similar to these studies, the students in this study reported that their instructors are using a variety of teacher immediacy behaviors. However, the one-on-one immediacy behaviors that students indicated instructors used infrequently in this study were the relational immediacy behaviors preferred by the students in Estepp and Roberts' (2013) study. The discrepancy scores revealed that students and instructors agreed that the relational immediacy behaviors were lacking. Thus, according to Estepp (2012) the instructors in this study might not be utilizing teacher immediacy to its fullest potential to build relationships with students, which might have detrimental effects on student motivation and engagement. Instructors should consider implementing more one-on-one immediacy behaviors to help improve interactions with students.

Additionally, the differences observed in this study confirmed Raviv et al.'s (1990) assertion that perceptions of classroom interactions can vary between students and professors. The finding that professors rated themselves higher on almost every immediacy behavior is also consistent with findings by Gorham and Zakahi (1990) and Martin (1994).

Teaching large classes presents several challenges related to higher student/professor ratio and classroom infrastructure in larger classrooms (theater style arrangement, fixed chair/desks, large size, etc.). These conditions can make it much more difficult to create an engaging environment in which professors build personal relationships with students. Results of this study revealed that professors seem to be doing a reasonable job of engaging the whole class through the use of immediacy behaviors, but not individual students. Student engagement is a precursor for learning (McLaughlin et al., 2005) and it would appear that some students in these larger classes are not being engaged. Further research focused on individual student engagement is advisable to determine if this realized. In the interim, professional development for faculty who teach larger classes on student engagement is suggested.

Of all the findings in this study, the most concerning to the researchers was the discrepancy between professors and students on the feedback provided to students. Faculty believed that they provided feedback often, whereas students believed that they received feedback occasionally. Providing timely and quality feedback to students is an important part of the teaching and learning process (Svinicki and McKeachie, 2011). It is unknown how frequently feedback was actually provided and quality of that feedback. Further research should be conducted to examine this issue more closely.

The results of this study may also have implications for the promotion and tenure process at the University of Florida. Evaluation of faculty teaching uses a combination of student course evaluations and a peer review of the teaching process. If faculty members' self-assessment of teaching differs from their students, their perceptions when evaluating other faculty may also differ from student perceptions. A former Dean of the College of Agricultural and Life Sciences at the University of Florida indicated that the peer review reports are often much more flattering than what student course evaluations indicate (Barrick, R.K., personal communication, June 21, 2013). Faculty may not have the appropriate knowledge to assess teaching. Further research could examine faculty knowledge of effective teaching principles. Additionally, professional development programs could be developed for faculty on how to assess teaching.

This study examined both student and professor perceptions of immediacy behaviors exhibited in larger

classes. Student and professor responses may not be an exact indicator of the actual behaviors that occur throughout a semester. Further observational research should be conducted to measure the actual frequency that these behaviors occur. Additionally, the convenience sample used in this study limits the generalizability of the results. This study should be replicated in other large classes and at other universities to see if similar results are realized.

Another opportunity for further inquiry on this phenomenon relates to class size, delivery method and level. This study focused on undergraduate classes with 50 to 100 students delivered face-to-face. Additional research should look at both smaller and larger classes. Further research should also examine online courses of varying sizes. Finally, research on graduate classes of varying sizes would add to our understanding of this topic.

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Determining the Usefulness of an Advising Video for an Animal Science Department

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Abstract

The usefulness of an advising video for students in an animal science academic department was evaluated through short interviews with undergraduate students and their academic advisors. Advisors' advising styles were determined, along with students' preferences for advising styles. Student and advisor perceptions regarding the usefulness of the advising video for both the prescriptive and developmental aspects of advising were characterized. Perceptions of the most important and useful characteristics of the advising video were also described, and potential areas for improvement were identified. The video was found to be most useful as an aid in the prescriptive aspects of advising, leaving more time for advisors to spend on the developmental aspects of advising. Students liked the video because it answered fundamental advising questions and directed them toward questions they should be asking in their advising sessions. They also perceived that watching the video would make their college experience easier. Students and advisors suggested that the video should be viewed by students in a first-semester introductory course to prepare them for their upcoming advising sessions. Comments from students and advisors indicated that the 17-minute video should be shortened or divided into smaller segments, and the content should be edited carefully to ensure accuracy of information.

Introduction

The educational community has a renewed commitment to valuable instruction and enhanced student learning. As a part of that community, college-level agricultural educators are reexamining past practices in an effort to determine the effectiveness and validity of techniques which for years have been performed and broadcast with almost religious dedication (Dyer, 1995). A necessary component of many instructors' responsibilities is academic advising, and it has become imperative to re-evaluate strategies in order to offer the greatest possibility for accomplishing the goals of the advisee, advisor, academic unit, and institution (Yarbrough, 2002). In particular, research on undergraduate advising and retention has demonstrated that students who are most satisfied with their advising are most likely to stay in school (Hale, Graham, and Johnson, 2009). "*Students are more likely to persist and graduate in settings that provide clear and consistent information about institutional requirements and effective advising about choices students have to make regarding their programs of study and future career goals,*" according to noted advising and retention theorist Vincent Tinto (2006).

While positive personal relationships have been shown to have an impact on advising success, alone they do not produce an extraordinary advising experience. Advisors must also provide students with information about their program requirements (such as pre-requisites and co-requisites). The information advisors receive in preparation for advising undergraduate students is generally limited to what is in the course catalog, and most faculty lack formal training in academic advising. Due to the limited amount of information they have about how to advise students, advisors sometimes struggle with completing the advising process in the most beneficial way (Gerdes and Crews, 2010).

Uhlik (2005) described the frustration many students have when attempting to decipher concepts like degree requirements and course restrictions to plan their college curriculum through graduation. In response to this problem, Rawlins and Rawlins (2005) demonstrated how advisors could more effectively traverse the advising relationship. They noted that advising relationships must be dynamic and customized because they are subject to numerous contingencies and limitations of time and energy on the parts of both participants.

Many colleges have decentralized their advising systems, which means that faculty members, not professional advisors, handle advising. Filling this advising

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role may be intimidating and sometimes inconvenient for faculty members; however, students prefer to discuss academic matters with faculty (Belchier, 2000). Faculty duties typically include serving as student advisors and providing advice about course information (Templeton, Skaggs, & Johnson, 2002). It appears there is a large gap between advisors' self-perceptions of their advising performance and students' perceptions of their advisors' performance. Upcraft and Gardner (1989) found that "*Faculty perceive that they provide much more beneficial advisement than students feel they receive. Students perceive a vast difference between what faculty advising should be and what it is.*" Gardiner (1994) found that 79 percent of college presidents who responded to a survey specified poor academic advising as being a problem on their campus. Crookston (1972) differentiated between prescriptive and developmental advising and laid out the numerous differences between the two styles. He explained prescriptive advising as authoritarian and formal; it looks for limitations and is based on low trust. The advisor teaches, and the student learns; it views students as lazy, immature, and in need of urging. Developmental advising involves responsibility and learning on both sides; it looks for possibilities and is based on high trust. Students participating in developmental advising are active participants and capable of self-direction; it is a shared collaborative effort.

O'Banion (1994) wrote a highly influential article about academic advising models, and what he wrote still holds true today. Contrary to arrangements where advisors make decisions for their students, O'Banion noted that students should be responsible for making decisions during the course of advising. Students should explore the available materials in order to be well-versed about choices to be made as well as the necessary procedures.

Harder et al. (2009) found that the college of agriculture and life sciences faculty rated undergraduate advising among the three competencies with the lowest relevance. O'Banion (1994) observed that few instructors/advisors have or are given the time necessary for in-service education designed to make them more effective advisors. They often teach full loads, serve on committees, conduct research, and sponsor clubs and organizations, leaving little time for in-service education.

Context and Purpose of the Study

In the 2011-12 academic year, the Animal Science Department at the University of Arkansas housed 249 undergraduate students. Following a national trend, 180 (72.3%) were females and 69 (27.7%) were males. Approximately one-third of the 249 were transfer students, and the rest came to the department as freshmen (H. Twilley, personal communication, August 30, 2013). Animal Science Department faculty and administrators alike had observed that advising effectiveness was limited by advisors' lack of time and by the fact that some faculty rank advising as a low priority. According to faculty opinion, students in the Animal Science Department at the University of Arkansas do not typically take an active role in their advising, are not being efficient in their course selection, and do not understand the reasons for course selection and the connection between curriculum and future careers. These observations were a result of personal communications between the researcher and faculty members prior to the development of this study. At the time of this study, this statement did reflect the opinion of the majority of faculty members, with each member being able to name only a few advisees who were the exception to these observations. To address these issues, a video was created to fill gaps in advising that had been identified in academic advising literature and that exist in the Animal Science Department. The video, created prior to this study and placed on the departmental website, was designed to allow students to learn to customize their curricula and to take responsibility for their own academic plans. The video was generally recognized as an imperfect product that had potential to address some of the department's advising issues, and it needed to be evaluated and improved upon.

The purposes of this study were to (1) determine the usefulness of an advising video in the Animal Science Department to students and faculty, (2) describe student and advisor opinions about the video and its effectiveness, and (3) make recommendations for improvements and for the production of similar videos in other college of agriculture departments.

Research Objectives

1. Characterize the advising styles of the faculty advisors as well as the advising styles their advisees prefer.
2. Describe the perceptions of students and advisors regarding the usefulness of the advising video for both the prescriptive and developmental aspects of advising.
3. Describe potential areas for improvement in the video according to student and advisor perceptions.

Methods

We selected a qualitative approach to determine advisors' and advisees' feelings about the advising video. Qualitative research is designed to allow for the examination of a phenomenon and to help describe it at a depth that would not be possible through quantitative research methods (Merriam, 1998).

Faculty and administrators in the Animal Science Department created the advising video to prepare students to take responsibility for knowing their academic requirements. This, in theory, would facilitate more productive student advising sessions. The video (http://animalscience.uark.edu/7056.php) was made available to students on the departmental web site in November 2011. Subsequently, in the spring and summer of 2012, incoming and returning students were advised via e-mail to view the video before their advising or orientation

sessions. The video focused on (1) teaching students how to custom-tailor their coursework to match their own career interests and (2) informing students about internships, research opportunities, club and team activities, and the scholarship application process.

Ten of the eleven undergraduate advisors in the Animal Science Department agreed to participate in this study and were interviewed after having viewed the department's new advising video. Also, using the qualitative subject selection method of "snowballing" or "networking," each advisor recommended two undergraduate advisees to be interviewed (Merriam, 1998). Most students were selected through advisor recommendations; however, not every recommended student chose to participate. Following Merriam's networking technique, the remaining students were recruited by the students who already participated. The primary criterion for the selection of undergraduate subjects was their "stock" in the advising process as described by their advisor. The networking process, which is intended to lead to a purposeful selection of subjects rather than a representative sample, allowed us to interview students who were identified as having a vested interest in the advising process and in how students in the department are advised. The result of this process was a purposively selected cohort of 17 undergraduate students who were described by their advisors as students who truly cared about the advising they received and the advising styles of their mentors. These students, 16 females and one male, represented a unique group of academically engaged students who would provide thoughtful responses to the interview questions. The group included eight seniors, six juniors, two sophomores, and one freshman. We surmised that these subjects were recommended because of the rapport they had built with their advisors; hence, the group contained more upperclassmen, who had known their advisors for a longer period of time. We asked the undergraduate students to review the advising video before they were interviewed. The University of Arkansas Institutional Review Board approved the interview protocol, and all participants provided oral confirmation of consent prior to participation in the study.

We collected data through focused, semi-structured interviews (Lindlof and Taylor, 2002) conducted with both advisors and advisees in the University of Arkansas Animal Science Department. Advisors and advisees were prompted with questions from similar questioning routes, but some questions were tailored specifically for advisors or students. Advisor interviews lasted 10-15 minutes. Student interviews typically took 5-10 minutes. (The questioning routes included a collection of three initial questions to elicit opinions and feelings regarding the usefulness of the video and three deeper, probing questions related to advising styles and preferred advising styles.) Both questioning routes were developed to specifically address the objectives of this study. Questions elicited the advisors' self-perceived advising styles, students' preferred advising styles, and both groups' perceptions of the usefulness of the advising video and their suggestions for improvement.

After presenting participants with Crookston's (1972) definitions of each advising style, we asked advisors which style of advising they felt they adhered to and how they thought their advising style helped their advisees. We asked students which style they felt their advisor followed, as well as which style of advising they preferred to receive. Field notes were also kept to supplement the interview responses and to help provide context for the interview responses during our data analysis. The following functional definitions were used in the interview questioning route:

Prescriptive advising: Delivering advising information related to course selection and scheduling accurately and efficiently, with the goal of enabling students to earn their diplomas and graduate "on time."

Developmental advising: Creating a mentoring relationship to develop the student academically, professionally, and personally with the ultimate goal being to enable students to clarify their future goals and plan strategies to accomplish these goals.

We transcribed audio recordings of each interview and loaded the transcripts into the qualitative visual analysis software NVIVO 9, which allowed us to take a systematic approach to the thematic analysis. This provided us with the opportunity to highlight excerpts from the transcripts and link the excerpts to emergent themes, resulting in a list of themes with multiple examples of data that supported the presence of each theme. We examined the transcripts carefully for responses that related to the project objectives, and, following the constant comparative approach (Glaser, 1965), we began to develop open codes (top-level categories) for emergent themes. As coding progressed, a hierarchy of themes and subthemes developed, and the open codes were organized into axial codes (top-level categories with descriptive sub-categories) (Strauss and Corbin, 1998), which ultimately represented the findings related to each of the research objectives.

Credibility, Believability, and Transferability of Findings

Merriam (1998) advised that the quality of qualitative research and the credibility of the conclusions are tied closely to methodology. The researchers in the present study followed several basic guidelines to ensure the credibility of the findings.

A clearly defined protocol of data collection and analysis was written and followed. Field notes (Emerson, et al, 1995) helped document the context of the interviews. We digitally audio-recorded all 27 interviews and transcribed them verbatim, providing the beginnings of an audit trail for the project (Denzin and Lincoln, 2005). Additionally, NVIVO 9 nodes and sub nodes (resulting from open and axial coding) were developed during the analysis leading to the findings, conclusions,

and recommendations of this study. Findings were verified through standard qualitative methods. Member checks—verification of findings with the actual subjects of the research—were conducted with two participating advisors and two advisees. After reviewing the data, findings, and conclusions, they verified that the results were generally representative of their feelings about the video. Also, three faculty research colleagues with experience in both qualitative research methods and student advising provided peer reviews and found the findings to be reasonable and supported by the data.

In qualitative case study research, transferability, or the ability for the findings to be generalized to larger populations outside the cohort of subjects studied, is not always possible or practical. Often, case study findings allow researchers to develop hypotheses about certain phenomena that can lead to further investigation (Merriam, 1998). This is the intention we had when we undertook this study. Still, consumers of qualitative research are free to apply the findings to any situations they may deem similar to this case, considering the context and the characteristics of the subjects observed, both of which are described above.

Findings

Advising Styles

Table 1 displays the differences between the self-perceived advising styles of the ten participating advisors and the perceptions of their advising styles by their advisees. Participants categorized the advisor as either developmental or prescriptive. The total number of participating students per advisor is listed down the right hand side of the table.

Table 1 shows a disconnect between some advisors' self-perceived advising styles and their advisees perception of their advising style. Advisors 1, 6, 7, 8, and 10 all show this disconnect between how they think they advise and how their students perceive their advising. Only half (2, 3, 4, 5, and 9) show a clear connection in perceptions, with all of their advisees agreeing with the advisor's self-perceived style.

Table 2 shows the differences between what styles of advising students feel their advisor uses and what style they prefer. Table 4 shows demographic data for the students: whether they were male or female, their year in college, and which advisor they belonged to. Of the 17 participating students, 12 (70.6%) said they received the advising style they preferred from their advisor. That left five of the 17 students preferring a different style of advising than the one they received. Students who preferred prescriptive advising appeared to be direct and specific in their needs and described themselves as being focused on career goals.

Table 1. Advisors' self-perceived advising style and their students' perceptions of the advisors' styles

Advisor Number	Self-perceived Style	Student Perceptions			Total Students
		Prescriptive	Developmental	Both	
1	Both [z]	0	1	1	2
2	Developmental	0	2	0	2
3	Developmental	0	2	0	2
4	Developmental	0	1	0	1
5	Developmental	0	1	0	1
6	Developmental	1	0	0	1
7	Prescriptive	1	1	0	2
8	Developmental	0	1	1	2
9	Developmental	0	2	0	2
10	Developmental	1	1	0	2

[z] Advisor felt he/she belonged evenly in both categories

Table 2. Student advising style preference and their perceived advisor's style

Students' Perceptions of Advisor's Style	Students' Preferred Advising Style			
	Prescriptive	Developmental	Both [y]	Total
Prescriptive	2	1	0	3
Developmental	1	10	1	12
Both [y]	2	0	0	2
Total	5	11	1	17

[y] It was felt that both advising styles were evenly represented

Student 14: "*I like to keep my business to myself. I would rather just come in and say 'I don't know what I need to do for this class, can you please help me out.' I just like to focus on my career.*"

The majority of students who preferred developmental advising communicated a need for guidance from time to time, and wanted their advisor available to discuss future possibilities.

Student 6: "*When I think about an advisor, it is supposed to be someone you come to when you have questions and regarding things that you don't have the answer for. You can come to them not only on academic things, but also on other things that affect academic choices.*"

Content

Importance of Understanding the Degree Check Sheet

The most common recurring theme throughout the study was the importance of students' understanding of their own degree check sheet, which contains a list of required and elective courses that students must take to complete their degree. Professors and students alike agreed that they viewed the explanation of the degree check sheet, requirements to graduate, and course information as being the most helpful information within the video.

Advisor 5: "*The area [of the video] that details the requirements for the major and minors, and what classes are available under each of the core units that we have. I think [students] would find that very helpful.*"

As the advisors and students discussed the portion of the video that addressed the degree check sheet, they mentioned several times that an explanation of the university's four-digit course numbering system was particularly appreciated.

Student 9: "*When I came I did not really understand where you start, and I did not understand the first number [of the course numbering system] was what class level it was and all that. So my first year I took a lot of junior level classes, and it was really hard but I did it.*"

Student Responsibilities Related to Advising

Students' responsibilities regarding understanding their degree plan, coming to advising sessions prepared, and keeping track of their academic progress were common themes with both advisors and students. Advisors stressed that ultimately students' academic progress is their own responsibility and that students should not go into advising blindly, expecting their advisor to essentially complete their degree plans for them.

Advisor 4: "*Student responsibility [is the most important message in the video]; that students need to take control of their own career path, career decisions, keeping track of scholarships, because they are all independent and they are only known to the student and the grantor of the scholarship. So that is probably the biggest take home message for students—active involvement.*"

Upperclassmen stressed the importance of having a plan and tailoring their college experience to fit their own needs. To do that, they first need to understand their degree plan; otherwise, students could end up wasting valuable time and money.

Student 7: "*[The video explained] when to take classes, and it had the schedule on there too, how Monday/Wednesday/Friday you can take this class, and it told you to take that your first semester when you got there, and not everybody knows that. You look at those intro classes, and there are seniors in them because they did not know that.*"

Prescriptive Advising Aspect of the Video

Advisors and students felt the video provides primarily prescriptive advising information. Several students and advisors observed that if the students were to view the video prior to advising sessions, less time would need to be spent on those prescriptive advising issues, and there would be more time available to devote to developmental advising, such as students' career choices and professional goals.

Student 2: "*Sometimes I found certain things in the video that were almost more useful than [what] your advisors have given you. Maybe [they were] assuming that you already knew stuff like that. So I would probably assume [that students should] watch it before going to your first advising, and then you can build questions off of that.*"

Advisor 4: "*I like the video because I agree wholeheartedly that students should look at their program before they come see their advisor… And then the advisor can focus on the content and that the sequencing of courses is correct and then to also spend more time focusing on their career objective and areas of coursework that they might consider to enhance their career path after they graduate.*"

Positive Feelings Toward Content of Advising Video

Most participants pointed out elements of the video they felt were helpful and well done. Upperclassmen who expressed an active involvement in their advising were surprised by some of the elements in the video they did not already know.

Student 13: "*I honestly think [the content] was great. This was the second time I have seen it and I feel like I have learned a little piece of something each time that just kind of slipped past me.*"

Advisors appeared to appreciate the explanations of frequently asked questions.

Several liked having these common questions answered in a format they felt all students could easily understand.

Advisor 7: "*[The students] are coming in first semester and get to see that video; it gives them all the background that they need to be successful as long as they follow the steps that are recommended in that video.*"

Positive Feelings About the Quality of the Video Production and Messaging

Advisors in particular made mention of the professional level of production they felt the video portrayed. They liked how the video visually separated the degree check sheet into smaller sections, highlighted key areas, and gave the viewer more to look at than a piece of paper. Overall, they felt it was well done.

Advisor 1: "*I think [the video] looked pretty slick. I liked the highlight in spots, how it moved through, I liked the highlighting of some of the texts that she did, and she did not read everything off the slide. It was very easy to understand. It was at a good pace… It seemed like a pretty professional job.*"

The Video's Ability to Provide New Information to Advisees

Advisors were nearly unanimous in agreeing that there were concepts in the video that students would not know prior to watching the video. The responses from students came in two different forms. Students either responded with an emphatic yes, or they explained that while their answer was no it was because they were upperclassman and had gone through advising so many times and had heard the material repeatedly.

Student 3: "*I cannot say anything particularly [stuck out to me as being a concept I did not already know], because [the information] has been reiterated to me so many times by [my advisor] and by the faculty, so no.*"

Even while some students did not learn any new information, they said they recognized that the video would be helpful.

Application of the Video

Video Is Best for Freshmen

Most participants specifically mentioned freshmen as being the group of students who would most benefit from watching the video. It was further explained by several participants that after two or three advising sessions, the content of the video should become common

knowledge to most students, but they also noted that having this knowledge as a freshman would have made their start at the University much easier.

Student 1: "*[The video] would be very very helpful. I wish 200% that I had watched this video when I first got here because I was really, really lost for my first year and a half.*"

Advisor 7: "*I think several parts of the video are going to be useful to students; especially freshman just now coming in may not have a feel for their course plan.*"

Advisors expressed a desire to show this video to freshman because they felt it did a good job of explaining the most basic questions incoming freshmen have, which advisors sometimes forget students do not know.

Show Video Before First Fall Advising Session

When asked where they thought the video would be most useful, the most common response was specifically after university freshman orientation but before their first full advising session that fall when they select their spring classes.

Advisor 6: "*[Students should] watch [the video] before they get into their first pre-enrollment for the spring semester their freshman year…The idea of the video was to try to get them prepared to come to their advisor with an idea of what they are going to take, and so I think if you start that the first year we won't have this problem.*"

Show Video in an Introductory Level Animal Science Course

Many participants specifically discussed making viewing the video mandatory in an introductory or freshman level course as the most effective way to reach all the lower classman and utilize the benefits of the video. The freshman-level course called Introduction to Animal Science lecture and lab were suggested. This particular course is offered in the fall, and the Animal Science department recommends that all incoming students enroll in the course in their first semester.

Student 6: "*Everyone has to take the Intro to Animal Science class, so I feel like that would really be a good place to have [the video] embedded in there.*"

Make Video Available Online

A few advisors and students thought that in addition to showing the video in a freshman level introductory course, the video should be made available online, and students should be made aware of its location. This is important because the video is already on the Animal Science Department's website, and yet most of the students interviewed were not aware of its location or its function. Advisors and students stressed that everyone should be made aware of its location so that they could refer back to the video as needed. Participants who made this comment felt strongly that the video would be a useful tool for refreshing students on the details of their degree plan before advising.

Suggested Improvements and Concerns

Video Length

The most common concern was that the video was too long. At almost 17 minutes, many participants found it hard to stay focused, keep from being interrupted, or even carve that much time out of their schedule to sit and watch it. Almost everyone who commented on the length of the video suggested breaking the contents up into shorter segments.

Student 10: "*The delivery [in the video] was a little long, a little boring. Maybe put it together in a series and then have a frequently asked questions or something like that at the end of each one so that everyone understands what is going on.*"

Advisor 10: "*The only concern I have with that video at all is that it runs almost 17 minutes. Even sitting here trying to watch it, I was disturbed twice with people coming in the office to do something. It is kind of difficult to watch something that long. I think it would be much better if it was broke up into segments.*"

Updating Video

The next most common concern was the importance of keeping the video content current. Participants reflected on how quickly information and images in the video would become dated, and that keeping the video current could become a large undertaking.

Advisor 3: "*[The video was created] only last year, but the pictures are already dated. And it is only good if it remains fresh. It is not one of these things you build in 2012 and say, 'check, done with that until 2030.'*"

Student 16: "*I know the requirements change all the time. I'm a junior and so if I talk to a sophomore their requirements could be completely different than mine even though we are going after the same degree. So I feel like you would have to update [the video] so much.*"

Appropriateness

While not a widely recurring theme, there was some significant concern for appropriateness of the content and tone of the video. Both students and advisors found elements of the video to cause confusion and unease. Many noted one particular comment by an advisor in the video in which the advisor states "I am bad at math." Though the purpose of the statement may have been to relate better to students and help them understand that it is possible to overcome academic deficiencies, the comment drew several negative comments from faculty.

Advisor 1: "*You [the narrator] are the faculty that the kids' parents are sending their kids up to. You've got to be perfect, and you can't say those things in that video.*"

Advisor 3: "*I try to be funny, but the editorial comments [in the video] are not funny to me. I just don't think the editorial comments add value.*"

The other theme related to appropriateness was the video segment on "how to survive chemistry classes."

Advisor 8: "*The point [in the video] about chemistry professors curving grades at the end… that bothers me a lot because I know some do curve grades at the end…, [but] to me that is a double-edged sword pointing that out, and I don't feel comfortable with that.*"

One student's observations about some of the jokes in the video exemplified the sentiments of several other students and advisors.

Student: "*There are a couple jokes [in the video] I guess I didn't understand, and it kind of seemed out of place because it was very professional and then there would be a kind of joke and it just seemed kind of really awkward. But I know [the narrator] so I understood, but incoming freshman don't…*"

Table 3. Emergent themes related to student and advisor perceptions of the video

	Objectives		
	Video Content	Application of Video	Suggested Improvements
Emergent Themes	1. Helped students understand their degree check sheet	1. Best for freshmen	1. Should be divided into shorter segments
	2. Encouraged students to take responsibility for their own degree progress	2. Should be shown to freshmen and transfer students before first fall advising session	2. Images and content must be updated frequently
	3. Provided prescriptive advising information, creating time for developmental advising in advising sessions	3. Should be shown in an introductory level animal science course	3. Should maintain an appropriate tone (avoid negativity and misplaced humor)
	4. Elicited a positive reaction from students vested in their own advising process	4. Should be made available online for students	4. Should contain advice that strictly adheres to campus policies
	5. Elicited positive reactions in relations to video quality		
	6. Effectively provided new information to advisees		

Adherence Rules and Policies

Some advisors and students recognized details within the video that may have violated university and department policies.

Advisor 1: "*I don't like that you used an unofficial check sheet [in the video], and I know why you did, [because] the course names are on there. I am concerned because… Y'all have made the video with a sheet that may not be available online for [students] to print out and use.*"

Conclusions and Discussion

Overall perceptions of the video by both advisors and students were positive. Advisors and their students were hopeful that the video would be used in advising as a step toward resolving issues related to poor academic advising such as those identified by Gardiner (1994). They found the content to be helpful to both advisors and students, regardless of the advisors' advising styles or the students' preferred advising styles. All participants felt it could be a useful tool to aid students in making the most of their college careers.

Objective 1: Advising Styles

In collecting demographic data, we realized that advisors' perceptions of their own advising styles and students' perceptions of their advisors' styles were not totally congruent. Most advisors viewed themselves as developmental or at least a combination of developmental and prescriptive, yet some of their students viewed them as strictly prescriptive. Incongruence similar to this was documented by Upcraft and Gardner (1989), who found that faculty think they provide more beneficial advisement than students think they receive.

Still, the majority of students thought they received developmental advising, which is the style most of them preferred, and others who viewed their advisors as prescriptive still desired to be advised developmentally. Student satisfaction with advising is closely tied to the congruence between students' preferred advising styles and the advising styles of their advisors (Hale et al., 2009). Developmental advising, preferred by most students, promotes a constructivist approach in which learning is a social activity and active experiences allow students to construct meaning (Hale et al., 2009; Williams, 2006). The average student may feel differently than those opinions collected using the snowballing networking method.

Table 4. Demographic data for students

Student Demographics	
Male	1
Female	16
Total	17
Freshman	1
Sophomore	2
Junior	6
Senior	8
Total	17

Objective 2: Advisors' and Students' Perceptions of the Video

Table 3 summarizes the themes that emerged from the advisors' and students' comments about their perceptions of the video. All participants in the study found the video useful. Advisors and students alike recognized the video's usefulness in regard to the prescriptive aspect of advising. Rawlins (2005) noted that advising relationships are not static; they are subject to the concrete limitations of time and energy of both participants. The video has the potential to maximize the efficiency of the advising meeting.

Advisors felt the video explained some of the more mundane advising topics, leaving added time for them to engage in their preferred developmental style of advising. They felt the video would answer questions for students before they ever came in for advising, allowing for a more productive advising session because the advisor would not have to answer the same questions for every advisee he or she saw. This would leave more time for discussion of deeper academic matters, which students prefer to discuss with their advisors (Belchier, 2000).

Students also liked the video because it answered some fundamental advising questions—in some cases,

questions they did not even know they should be asking in their advising sessions. Students also perceived that the video would make their college experience easier. They felt they would not make as many mistakes in scheduling and planning their courses if they better understood the degree check sheet and had the details of their degree plan explained to them the way the video explains them. This observation is important because Hale et al.'s (2009) research demonstrated that students who are most satisfied with their advising are most likely to stay in school. This also relates to Tinto's (2006) findings that students are more likely to graduate when provided clear information about their institution's requirements, allowing them to make better choices regarding their programs of study and future goals.

Advisors and students had several thematic perceptions about where and how the video should be used. They perceived the video as a useful tool for students—especially first-semester freshmen and transfer students—and suggested that these students should view it during their first semester prior to their first advising session. Also, all participants suggested that the video should be used in a required first-semester introductory course. O'Banion (1994) recommended that students should be responsible for making decisions during the course of advising. Advisors and students alike agreed with this recommendation, noting that the video would be especially helpful for first-semester students as they prepared themselves for upcoming advising sessions.

Objective 3: Areas for Improvement

Yarbrough (2002) emphasized the importance of re-evaluating current advising strategies in order to offer the greatest possibility for accomplishing the goals of the advisee, advisor, academic unit, and institution. The student and advisor interviews revealed several characteristics of the advising video that should be improved.

A frequently mentioned suggestion was that the video be broken down into shorter segments. Advisors and students alike agreed that the 17-minute video was too long. At this length, it was difficult for participants to find that much time to devote to watching the video without being interrupted. The participants also found it difficult to stay focused and interested in the video for that length of time. Another justification for breaking the contents of the video into shorter segments came from the concern about keeping the content up-to-date. Participants thought it would be easier to change, update, and if necessary re-record the audio for videos that are shorter rather than for one video that is 17 minutes long.

Additionally, concern about the appropriateness of certain portions of the content was expressed by advisors and students. The two sections brought up most often included jokes about the narrator being bad at math, as well as comments on "how to survive chemistry classes." These concerns can be remedied by either cutting out the segments, or re-recording the audio with those sections left out.

A few participants also thought the content should be reviewed for accuracy regarding university policies. They suggested the content be examined to ensure university policies were being followed prior to this video's implementation as a regular advising tool.

Recommendations for Further Research

Further research needs to be conducted once the video is implemented to determine (1) whether the video has improved instructors' and students' perceptions of the quality of advising sessions; (2) if the video has increased understanding of the degree plan and check sheet by students; (3) what additional improvements should be made to the video; and (4) how this video model could be adapted and utilized by other departments within the college and across the university. The success of this advising tool and similar tools that might be developed depends on this type of practical evaluation.

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IMPROVING AGRICULTURAL INSTRUCTION USING PERFORMANCE BASED INSTRUCTION

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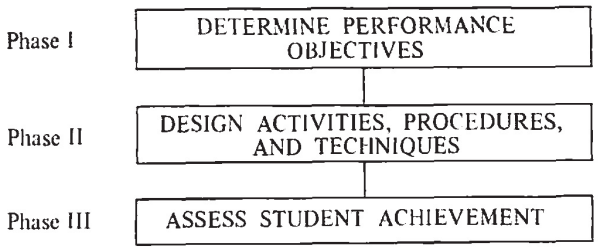
Improvement of the instructional process is an "in" phrase in today's colleges and universities. Students, administrators, alumni, and others are emphasizing the need to improve the quality of instruction in our institutions. Schools of agriculture are not spared from these expressed needs to improve the quality of their instruction. Gardner[1] in 1971, addressing a symposium on instruction held by the North Central Region Colleges of Agriculture stated, ". . . all of us here (faculty) are concerned about the caliber of instruction, and even more important, about the amount of learning that takes place in our colleges." Students also are expressing their feelings concerning poorly organized and ineffectively presented courses.

This paper is written to provide insight into one idea (the instructional model) which can improve the quality of instruction in colleges of agriculture and is referred to as Performance-Based-Instruction.

PERFORMANCE BASED INSTRUCTION

This model has three basic parts: (1) performance objectives, (2) classroom instruction, and (3) student assessment. Figure 1 provides a graphic illustration of the model. The rationale for such a model is simple. First, the instructor asks himself the question, "What do I want my students to be able to do at the end of the course?" This question, once answered, is worded in expected student outcomes. referred to as performance objectives.

FIGURE I:
PERFORMANCE BASED INSTRUCTIONAL MODEL



The second step is for the instructor to decide what activities, procedures, and techniques can be used to bring about the changes in the students set forth in the performance objectives. The final phase is to determine if the students have achieved the objectives. The following sections provide an explanation of each part of the performance-based-instructional model.

Performance Objectives

In this paper the term performance objective will be used and defined as: "clear, concise statements of expected student outcomes." This definition shifts the emphasis from teacher processes to student outcomes. Teacher processes imply the activities of the teacher in the classroom; student outcomes relate to the expected student performance at the end of the instructional sequence.

If we are to focus our courses on student performance, that is, student learning, we must be concerned with specific items they learn. Is this the case in our courses? In many instances the answer is NO. We commit ourselves to covering a book or to simply presenting as much material as can be done in the amount of time available. This emphasis on quantity of output often disregards the learning desired of the students. The question becomes, "Does the instructor cover as much as possible," or "Does the instructor focus upon expected student outcomes and gear his strategy toward this end?" Clearly in a performance-based model one would be concerned with expected student outcomes.

Levels of Objectives

The term 'levels of objectives' refers to the degree of specificity required to develop the objectives that cover a segment of instruction. Common to most instructional activities are the terms courses, units, and lessons. Each one of these terms refers to an instructional level. One may, and probably should, develop objectives that transmit expected student outcomes at each level. The balance of the discussion on performance will center on the lesson level of instructional planning.

A performance objective at the lesson level should have three basic characteristics as stated in 1971 by Mager[2]. First, the performance objective should be measurable. Second, performance objectives should contain a statement of the conditions under which the student can achieve the objectives. Third, a performance objective should specify the minimal criteria necessary for a student to have achieved the objective. The following objectives are presented to illustrate the basics of performance objectives.

"To teach students the importance of controlling weeds in corn."

This objective relates to a teacher process. It says nothing concerning the learning expected of the student. Now let's rewrite the objective to include Mager's criteria as described in the previous paragraphs.

"Given a list of ten weeds commonly a problem in corn, the student will list the steps involved in controlling each weed."

Is it measurable? Yes, it would be very simple to measure this objective. What are the conditions? The student will be given a list of ten weeds. This implies that the conditions will be on a written test. What are the minimum criteria for acceptable performance? The student will list the major steps of control.

Quite clearly, the objective has been improved. Written in the Magerian form it communicates to the student what he must do.

Instructional Activities

Once the instructor has stated the expected student outcomes, the next step is to organize the instructional strategies. In this phase of the performance-based-instructional model, the instructor identifies the vehicles used to present the subject matter to the students so that the student can perform each objective. Coordination between the expected student outcomes and the instructional processes is necessary.

To illustrate this, the following example is provided. Assume that one is dealing with the objective previously mentioned concerning weed control in corn.

"Given a list of ten weeds common to corn, the student will list the steps involved in controlling each weed."

If the student is expected to list the steps in controlling weeds in corn, the instructor should provide the environment for the student to obtain those facts. This environment may be varied and will include such items as audi-visual techniques, lectures, field trips, laboratories, exercises, etc. This instructional environment should be designed so that the student can meet the criteria set for him in the objective.

Planning a course is made easy by writing the performance objectives and then outlining the necessary content and the methods of presentation to be used to provide the student the materials needed to achieve that objective.

The use of objectives provides a guide by which a course can be developed. Without the use of performance objectives, course organization and presentation is often based solely on quantity of output by the instructor in a given time period.

Student Assessment

The third phase of the model involves the use of assessment tools to determine if the students meet the criteria for the objectives. The nature of the assessment may be as varied as the environment used to transmit the subject matter. Common assessment tools such as paper-pencil tests, performance tests, oral tests, etc., are used. Regardless of the technique used, the overriding emphasis should be on determining if each objective is measured.

If the instructor has outlined in careful detail the objectives at the lesson level, valid student assessment is made easy – each objective specified as expected student outcome. Within each objective is written the conditions upon which the student is expected to perform the skill. Also, within each objective is the minimum criteria you will expect as evidence of satisfactory performance of that objective. Questions can be constructed to measure each student's ability to perform each objective; however, questions are not the only means of measuring objectives.

This procedure has an added incentive to the instructor, as it provides a framework from which to evaluate students' performance. Likewise, it insures that assessment instruments (tests) are based on the objectives of the course. If students are cognizant of the objectives and the test is designed to measure the objectives, considerable improvement can be made in many courses.

SUMMARY

The Performance Based Model was discussed in three segments: (1) performance objectives, (2) classroom instruction; and (3) student assessments.

Performance objectives were defined as clear, concise statements of expected student outcomes. A distinction was made between the levels of objectives: the discussion was centered on the lesson level. The Magerian method of writing performance objectives was presented. Magerian objectives have three characteristics: (1) they are measurable, (2) they specify the conditions under which performance is to take place, and (3) they state the minimum criteria necessary for successful achievement of the objectives. Examples were presented to illustrate this type of objective.

Classroom instruction, the second phase of the model, was discussed. It was noted that close relationship exists between the performance objective and the instructional activities needed to help each student achieve the pre-stated objective.

Finally, a case was made for using performance-based-instruction to improve the assessment of student outcomes, i.e., to determine student progress.

Performance-based-instruction will provide a tool whereby the instructional process can be improved.

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Guiding Principles for Teaching with Technology

Classroom response systems, electronic textbooks, Prezi®, course management systems (e.g. Blackboard®), social media, online lectures, video chats – welcome to the classroom of the 21st century! For those accustomed to the traditional classroom, the technology may at times seem overwhelming. The following ten guiding principles for teaching with technology serve as a resource for educators integrating technology into any type of course – distance learning, hybrid, or traditional face-to-face classroom.

Focus on pedagogy, not technology. Start with your imagination. Initially, set aside thoughts of particular technologies. Think first like a science fiction storywriter. Identify how you would like to teach if anything were possible technologically. Your vision will help others help you identify the most promising and appropriate technologies to make your vision a reality.

Set expectations clearly. When teaching practices change, students need to understand clearly how you expect them to adapt. This is especially true when introducing new technologies to the classroom. When students' personal computers malfunction, what are your expectations for completing assignments? What if the campus network is inoperable for 24 hours? For one minute? What are your expectations? What digital file format (e.g., PDF, Word, etc.) do you expect? What about use of computers and cell phones in class? Does your syllabus state that you reserve the right to make changes as needed?

Choose high-quality over high-tech. Just because it is the newest option with the most bells and whistles does not mean it is the best choice for your course. In some cases and for some professors, a piece of chalk or dry erase marker is the best educational tool. High-tech does not work well for all courses and can be distracting and discouraging for some students. The trick is to find what technology works best for what you are trying to accomplish, your students, and your level of comfort. Just because a colleague is teaching a course using a particular technology, does not mean it fits the needs of your course – be selective and deliberate when using technology.

More technology requires more organization. The more technology you integrate into your course, the more organized you should plan to be as you prepare your course. Recognize that not all students have been exposed to the technology you are using in the class. For much of the technology you may use, it is important to have resources explaining the technology and how-to guides and exercises for practicing with the technology. One idea is to have modules with quizzes at the start of the class session for each piece of technology that will be utilized (e.g. how to navigate the online classroom management system). Embedded videos explaining the technology can be highly effective.

Accommodate before you innovate. Sometimes your preferred technologies may be inaccessible to some students. Not all students may be able to afford laptop computers and cell phones for use in class. Not all students may have Internet access at home. Your pre-recorded lecture videos may be inaccessible to students with visual or hearing impairments. Many of these challenges have existing technological solutions. Be aware of accessibility and accommodation concerns and consult with your campus disability resource center, if needed.

Appeal to multiple styles of learning. Some students love electronic textbooks. Other students love social media. And yet other students love online lectures. The bottom line is that while most college students today are adept at using technology, not all students find the same electronic resources engaging and beneficial to their learning. Therefore, it is important to include variety in the technology you use in teaching.

Don't let technology make you mechanical. Academic technologies can automate teaching in many ways. Quizzes can be graded automatically. Email reminders and pre-recorded content can be sent automatically. Course progression for individual students can be managed automatically. These can be valuable time-saving innovations. Still, students need and will expect specialized, real-time attention from their instructors as well. Consider offering telephone and/or web-based office hours if teaching online.

Use technology to teach, not entertain. Show a funny YouTube® clip in your class and you'll probably capture the attention of your students. As a class opener or to engage your students this can be highly effective. However, when overdone, the technology is now entertaining, rather than teaching your students. Technology in the classroom can be entertaining, but should ultimately support the student learning outcomes

of the course. For example, PowerPoint® lectures that integrate animation, automatic slide transition and excessive embedded video links can be distracting and take away from the lecture itself. Instead, develop slides that are organized, have a limited amount of text, and include relevant and interesting graphics.

To legitimize, you need to personalize. Cheating and plagiarism are very legitimate concerns. Expanded use of technology in classrooms can raise these concerns. For example, student can copy in-class exams using a plain-looking pair of eyeglasses with a high-resolution camera ($80). Personalization in different forms can help. Require students to show photo IDs when submitting exams. Create assignments that require students to record themselves demonstrating competency. And, of course, get to know students' personal concerns, achievements, and names.

Prepare for technology to fail. The reality is that technology does not always work. The projector bulb may blow in the middle of an important PowerPoint® lecture, the speakers may not work for the video clip you are trying to show, a storm may result in power outage at the time students are supposed to be taking an online exam. We *know* it will happen at some point, so it is important to be prepared with a back-up plan and to be accommodating. Before the start of the course, think about how you may handle failure of technology and be fair and consistent with all students.

Successful teaching strategies integrating technology require both expertise in the course content as well as knowledge and experience with the selected technology. The bottom line is to use the technology you feel most comfortable with and that best supports the learning environment and outcomes for your course.

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Multi-Language Challenges in International Agroecology Courses

Introduction

We have all experienced communication challenges during lectures, discussions and team field activities in our international MSc degree programs. When English is the native language for only a small number of student participants, and also for few of the teachers, it becomes difficult for those with less experience and language facility to keep up with discussion. If we observe a student carefully searching through the dictionary to locate one word, it is certain that they are not following the ongoing discussion.

Numerous literature reports emphasize the importance of instructors using alternative methods of presentation, of engaging students and of encouraging students to express themselves (eg. Izzo, nd). This Ohio State University "fast facts for faculty" worksheet also suggested guided notes, comprehensive syllabus and detailed study guide (course preparations), illustrations, handouts and visual materials (methods of presentation), and personal real-life examples as methods to engage a multi-language class of students. Stephenson (2012) states that the burden for communication rests on the instructor and many cross-language barriers may be overcome by greeting the class in a friendly manner, being courteous to every student and confronting the language challenges up front. Students introducing themselves, mentoring their peers in how to pronounce their names, openly recognizing language differences as an issue to be considered are all steps toward opening the learning community to new experiences and growth. Often the process will take longer and visual examples and personal experiences will help to build understanding and confidence. We recognize these challenges and openly discussed them in our own multi-language ENOAT (European Network of Organic Agriculture and Agroecology Teachers) workshop.

A workshop on language and communication issues was conducted during the ENOAT workshop in Plovdiv, Bulgaria in 2013 to uncover specific experiences of participants, to learn how different people deal with this language situation and to summarize the general and specific approaches used by instructors to design learning opportunities that overcome or at least minimize language problems.

Method

The facilitator posed two key questions to a group of 16 educators: 1) In which situations do you perceive problems due to teaching in English? Participants had to write down their individual perceptions of challenges and then discuss these with a group of three other persons before reporting out to the entire plenary group. And then he posed another: 2) What are potential solutions to these language challenges? In the results section of this report we present the comments written by people, and expand them with some discussion about each issue. The solutions were provided by the participants and expanded by the facilitator and recorder of the session after reflection on the overall language challenge issues.

Results

We summarized comments from the 16 educators into *eleven observations* about their own classes and personal experiences where English was the language of primary communication and the 'official language' of the course:

1. Knowledge of English for older generation teachers in some countries is a challenge, especially for those who are not fluent and often those who have not studied abroad in an English-speaking country; it appears that this is improving with younger instructors having more experience and practice.

2. English knowledge in our students is a current challenge and this will continue as more courses are offered in this 'common academic language' used in international education programs in Europe and elsewhere. Even when test scores of applicants appear to be acceptable, at times there is a disconnect between what people are able to do on a written/oral exam and what is possible in the rapid give and take discussion in the classroom.

3. Correct or precise translations or terms may be a problem, since this may be different in different cultures even when the terms seem to have clear meaning in U.K., U.S., Canadian or Indian versions of English; just as when we use terms in publications, it is important to provide a definition if there is any doubt.

4. Often it is difficult to understand properly the questions that are posed in class due to English being spoken with many different accents. This is sometimes a challenge both from teachers to students and vice-versa, and from students to students.

5. Field trips and excursions with presentations by farmers may present special cultural and language challenges due to differences in backgrounds, lack of farm experience for some of the students and limited experience of some farmers with an international visitor group, all in addition to a language barrier.

6. A particular challenge may be presentations by farmers or other stakeholders in their native language which have to be translated by the teachers; there is the inefficiency of delay, but also a chance of misinterpretation of details.

7. Agricultural terminology may not be known by teachers who come from the pedagogy or language department, and at times they are the ones who prepare and present language classes to students who are new to English. It is particularly difficult for non-native speakers of the language to use agricultural terminology, even though they may be relatively fluent in their own specific teaching or research domains.

8. Psychological resistance and discomfort may be part of any multi-language situation in courses and in the field work with students. Obviously some people learn a different language more quickly than others.

9. Teachers may not be fully prepared to teach in English, even though they have years of experience with conversation, and may be hesitant to launch a new course that must be taught in another language.

10. It takes more time to prepare classes in English than in one's native language and there may or may not be extra compensation for this additional time and energy investment by the teacher who is already dividing time between teaching and research.

11. We recognize that some students have as a major objective the improvement of their language skills, in addition to the content of the course in organic agriculture or agroecology. We respect that goal and certainly encourage language improvement; however, we must also state that acceptable language level is indispensable, in particular for courses with participatory learning approaches.

These are *some potential solutions to the challenges* related to English, as discussed in the plenary session and expanded by the facilitator and recorder:

1. It is important to develop a more rigid screening process to be sure that students are well prepared when they arrive to begin the courses; students may do well on written essays, but their oral English skills may not be good enough to allow them to participate immediately in the full discussions in class. Compulsory tests could help; personal and individual interviews can be done by telephone or by Skype today, or by in-person interview if this is possible. When a certain level of competency is not achieved before starting a class, this creates frustration on the part of students and instructors alike, as well as mis-communications about assignments and expectations. It is unfair for those who are well prepared to conduct a course at "the lowest common language denominator" so that those who are just learning English can keep up with the class.

2. We can offer English language competency courses for students to get up to speed in the new language; these should ideally be with native speakers of English. Additional tutorials for students should be available, and we could provide more literature in English and make it available to students.

3. There is value in specific help sessions for those students who need them; language tables or meals where students gather for conversation in an informal setting can be useful, and writing centers are available at some universities.

4. One approach to improve instruction is to provide English courses for teachers, and perhaps provide paid incentives for them to attend, or at least not charge for these classes. We may need additional budget for this activity. Individual tutoring for teachers could be made available, one on one. Assessment of teachers could be a pre-requisite for allowing a course in English.

5. Instructors could start with limited lectures in English; the university could provide more preparation time for the first time a course is taught in English. In some universities, academic credit accounting for teachers may be 1.5 times for courses in English.

6. Power points in English can be used to reinforce lectures in class, so that students both see and hear the material presented.

7. When organizing the class for field work or classroom projects, we should mix teams in project work and if possible have at least one native English speaker on each team.

8. Translations on farm from a farmer presentation

may be problematic and it is difficult at times to interrupt and translate. It is useful to prepare written information ahead, including descriptions of farms, photos of activities, maps, and lists of enterprises. Native speaking students may be asked to support translation from the farmer. More observations and active learning on farms instead of verbal communication may be more effective for learning.

9. Native speakers often speak too long and too fast; it is important to orient accomplished speakers of English to consider their audience and speak slowly.

10. We need to define technical terms and use photos or figures in addition to words to explain concepts when possible; having small cards with English technical terms or glossaries with translation could help students practice and build understanding.

11. Peer review of student work before handing in assignments can help improve language of the reports and serves as an additional learning experience for the mentor.

12. Technical reports and translations into English of articles familiar to students in their own languages could be more available; preparing a glossary of terms for students to learn should be useful for most courses.

13. We should create teams with a mix of nationalities, gender, learning styles, and language skills for project work.

14. One option in extreme cases is to have discussion in small groups in native languages, and then have a report out session in English to all other students.

15. We can overcome difficulties with understanding questions by having them written, or have students repeat the question, or have a neighbor interpret the question; we can always ask the class what they think and how they would respond.

Conclusions

No simple answer exists to solve communication challenges related to English as context will vary and there are many individual differences. Instructors learn through experience how to handle unique situations, but it is important to anticipate this language challenge and to prepare as much as possible by using the 15 guidelines listed and described above.

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Teaching Sustainable Crop Production through Collaborative Learning

Teaching sustainable practices to a diverse group of students with varied background and divergent perception of sustainable agriculture is a challenge. For instance, students differ in their perception about use of genetically modified organisms; organic agriculture; conservation tillage etc. One of the methods to teach about such topics could be through collaborative learning. Collaborative learning is an active learning technique where students work and learn together in groups to accomplish shared goals. According to Gerlach (1994), "Collaborative learning is based on the principle that learning is a naturally social act where the participants talk among themselves and that it is through the talk that learning occurs". In the collaborative learning, the learners have the opportunity to converse with peers; present and defend their ideas; exchange diverse beliefs; question other conceptual frameworks and are actively engaged (Smith and MacGregor, 1992). The goal of collaborative learning is to shift the learning from a teacher-centered model to student-centered model (Smith and MacGregor, 1992). Two conditions are a must for collaborative learning to be effective and successful: i) there must be a group goal or shared responsibility for the whole group; and ii) there must be individual accountability.

A group discussion project was introduced in a senior level class in sustainable crop production where students were divided into four groups. A reading was assigned a week before the class discussion on topics in sustainable crop production. Each of the four groups was assigned a specific role to play during the group discussion. First group, called 'Presenters' presented the findings from the assigned reading highlighting the salient points. The second group, called 'Enquirers' submitted their questions based on the reading at least two days in advance to the class via the course website. The third group, 'Problem Solvers,' presented solutions to the questions/issues raised by the 'Enquirer' group. Finally, the fourth group, 'Supervisors,' took

notes and summarized the whole activity including the salient findings presented, the questions raised and the solutions offered during the group discussion. The group roles were rotated among the groups so that each group was assigned each of the four tasks at least once during the semester (Figure 1). During each discussion activity, each group was evaluated on a range of questions specific to their group role by the peer students, the instructor and the TA. The students were also asked to provide their anonymous feedback about what they thought was the most important lesson that they learned from the group discussion. These results were then analyzed to assess how the group activity impacted the student learning. The percent of student participants who correctly answered the question ranged from 70-100% during the semester.

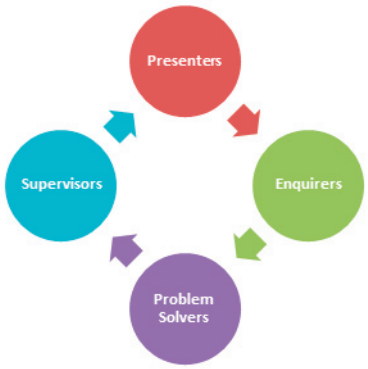

Figure 1. Switching of the four tasks among groups.

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Addressing Students' Financial Constraints in my Teaching and Advising

Introduction

This teaching tip was prompted by a question from the Ohio State University Center for Teaching Excellence: "*We are curious about how your teaching is affected by your understanding of the financial realities of your students."* After some reflection, I offer these thoughts based on 35 years in the classroom.

Teaching

I was a regular in my campus bookstore each quarter, often to see if textbooks I required were in stock. But I was insulated from the recent prices of new and used textbooks by complimentary desk copies for adopting a text or examination copies for considering a publisher's textbooks. Then I had my eyes opened when I did a professional teaching enrichment leave at the State University about 40 miles from my home. I had to pay for the required books and other materials. So it was a powerful reminder that in the face of expensive textbooks, there are multiple strategies to lower textbook costs. Recently academic books may be purchased as E-books or textbook rentals. The advantage of rental compared to buy (preferably used) and sell back at the end of the semester is the sell back value can be zero if the teacher orders a different text or if the publisher brings out a new edition. In my own teaching to replace commercial lab manuals, I prepared four manuals or study guides that were produced in the campus copy center and sold in the bookstore. I also did not change texts frequently, and I would provide an old syllabus with lecture topics identified with pages from the previous edition of the text. This made the most recent past edition of required texts of value if students had a classmate or friend willing to lend or sell it. Finally, if I had two copies of a required textbook, I placed one on closed reserve in the campus library for student use. This provides access to textbook assignments for students without funds to buy/rent one.

In the courses I taught I usually required a suitable text and put assigned pages for each lecture on the syllabus. I suggested on the first day that they make a friend or two that first class and buy the book in partnership with them. If one of the partners has already purchased the book, no problem, sell shares to the new partners. Even if three people share a textbook, there will be many hours each week that it sits cover closed on a partner's bookshelf. The predictable difficulty will be who gets the book the day or night before a test. This dilemma illustrates a weakness of partnership form of business organization when equal ownership results in deadlock if the partners cannot agree on a sharing scheme. This is a good life lesson in any course. The last bit of advice was to sell your book back to the campus bookstore, but only if you won't need it for later coursework or on your professional bookshelf. My campus store offered one half of the book's new price at buyback if required next term. Faculty should report the renewed adoption of textbooks early to maximize buyback value for their students.

Advising

In my advising duties I tried to ascertain if the student was working part or full time. If so, they needed to see that they could not take the same load of course credits as a schoolmate receiving family aid or scholarships and devoting all their time and energy to school work.

Occasionally mature and well-organized students can work and maintain a full academic schedule, but they are exceptional managers of their time. I told new students and their parents that the bookstore typically ordered a modest number of used textbooks and early purchase of a good used copy would save 25% in the campus bookstore and more if working through web- based book sites such as Amazon.com.

The last pro-student action in every class was to suggest that they put their name, address, phone, and e-mail address in their books as soon as it was firmly established they were staying in my course. So often, I would observe expensive textbooks left without their owners' identifying information upon entering or leaving a classroom. Like unbranded livestock, no owner ID makes an easier decision for the unscrupulous finder to keep the book or to sell it.

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