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Introduction to the Special Issue

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Higher education is called to develop students into global citizens that are prepared to investigate the world, recognize different perspectives, communicate ideas with diverse audiences and take action[1]. This goal is included in higher education mission statements and carried forward in strategic plans. It's become a part of general education requirements and is the focus of new centers and initiatives.

For a long time, global learning was relegated to study abroad. The idea likely became popular with the historical traditional trip through Europe, often referred to as the Grand Tour, that aristocratic youth embarked upon when they came of age. Fast forward to the nineteenth century, when study abroad grew in popularity as institutions of higher education started to explore creative ways to inspire their students to learn about the world.

We can't afford to take such a narrow view of global learning today because most students do not have the luxury of international travel. According to the 2018 Open Doors report[2], only one in ten undergraduate studies abroad before graduation, and the agricultural sciences are not among the top majors sending students on study abroad. While there are initiatives that endeavor to increase the number of students engaged in education abroad, many barriers remain. While study abroad remains an important tool in the toolbox of global learning, the question begs: How are we serving students who do not study abroad?

Furthermore, the world is integrated and complex, and learning about these complexities cannot and should not be relegated simply to international travel. A favorite quote of mine that illustrates this concept is, "It's not about location; it's about learning."[3]. Graduates in all majors need to understand the global movement of ideas, products and people. They need preparation to tackle a range of wicked problems including poverty, food security and climate change. What's wonderful is that we don't need to convince our students on the importance of confronting these issues – many of our students come to us telling us that they want to make a positive difference in the world. It's up to us as educators to give them the support, tools and resources that will help them to be successful once they graduate from our institutions.

The special issue of the NACTA Journal is developed around the theme of engaging students in global agriculture in order to highlight the critical importance of integrating global learning into the agricultural sciences. Assembled into this issue are a collection of articles that begin with global learning in domestic contexts and then progress into global learning in international contexts. I hope that the NACTA community will find this special issue to be informative and useful as we strive to engage all students in global agriculture.

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[1]Boix Mansilla, V. & Jackson, A. (2011). Educating for global competence: Preparing our youth to engage the world. Council of chief State School Officers and Asia Society. Retrieved from https://asiasociety.org/files/book-globalcompetence.pdf
[2]Institute of International Education. (2018). Open Doors Report. Retrieved from IIE: https://www.iie.org/Research-and-Insights/Open-Doors
[3]Sobania, N. (2015). Putting the Local in global education. Sterling, Virgina: Stylus.

Contents

Interdisciplinary Project-Based Learning: Developing Low-Cost Hydroponic Systems for Subsistence Farmers in Ghana

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Abstract

This interdisciplinary project introduced undergraduate agriculture students to the methodology of Project-Based Learning through investigating the benefits, challenges, and cost-effectiveness of hydroponic units for growing leafy greens. During the 2016-2017 academic year, three professors from The Ohio State University's Agricultural Technical Institute (Ohio State ATI) embedded Project-Based Learning into the undergraduate curriculum in greenhouse management, agricultural communication, education and leadership, and the Ghana education abroad programs. Faculty and students cooperated to develop, test, analyze and improve, a low-cost hydroponic system made from commonly available materials that functions without electricity for use by subsistence farmers in Ghana, West Africa. This interdisciplinary Project-Based Learning venture allowed the researchers to meet numerous educational, technological, and institutional goals on the Ohio State ATI campus and abroad.

Introduction

In 1998, the Boyer Commission on Educating Undergraduates in the Research University at Stony Brook University announced ten key changes needed to improve the academy. The first two required universities to "make research-based learning the standard and construct an inquiry-based freshman year" (p. 1). In response, some universities encouraged their faculty members to involve undergraduates in research to improve their active learning of both content and process across the curriculum. This approach to education led The Ohio State University Agricultural Technical Institute's (Ohio State ATI) Ghana Research and Education Abroad (GREA) faculty members, Dr. Elder and Dr. Crook, to consult with a recently hired greenhouse faculty member, Dr. Samarakoon, to collaborate on a project that would engage students in active learning.

Pedagogically, the three chose an interdisciplinary Project-Based Learning approach to involve students across three areas of study in low-cost hydroponics research. Project-Based Learning (PBL) is an instructional method developed upon "a set of learning experiences and tasks that guide students in inquiry toward answering a central question, solving a problem, or meeting a challenge…through intellectually challenging tasks and products focused on research, reading, writing, discussion and oral presentation" (Larmer and Ross 2017, p. 5). Given our students' interest in applied education, the team elected to use the PBL framework for the joint research between faculty, students, and farmers related to food security.

In the past 50 years, modern agriculture has "helped farmers double food production while essentially freezing the footprint of total cultivated farmland" (Crop Life America 2011, p. 1). The increased agricultural productivity has decreased hunger by nearly half, and yet one in four Africans does not have enough to eat (UNDP 2016). Purchasing enough food is especially difficult for the 47% of sub-Saharan Africans living on less than $1.25 per day (UN 2012). Moreover, lack of access to land for growing their food hampers their ability to feed themselves (World Hunger 2016). Bill and Melinda Gates (2016) reported that 40% of children in Africa have stunted growth due to hunger. Additionally, numerous non-preventable problems, such as drought and blight, and more preventable problems, including war, disease, and decreasing land fertility due to less-than-optimal farming practices, negatively affect the amount of food farmers can produce (Kader 2005).

As in other African countries, the people of Ghana struggle to achieve food security. Ghanaian farmers produce "only 51 percent of her cereal needs, 60 percent of fish requirements, 50 percent of meat and less than 30 percent of raw materials needed for the agro-based sector" (Darfour and Rosentrater 2016, p. 1). More than 60% of Ghana's

farmers are smallholder subsistence farmers, who cultivate one to five acres and depend on rainfall to grow the bulk of Ghana's food (SRID 2001). Typically, these subsistence farmers practice rain-fed agriculture, which makes cultivation of greens during the January-to-April harmattan or dry season impossible. Stews prepared with indigenous leafy greens, such as gboma and ademe, form a significant portion of the diet and provide vitamins A, C, K, calcium, manganese, riboflavin, and folate for farm families (Afantchao 2017, p. 6).

For a decade, Ghana Research and Education Abroad faculty members had educated their students about these issues and prepared them to work with Ghanaian farmers near Ho in the Volta Region on projects to improve food security and farmers' incomes. In pre-departure preparation, students studied and discussed appropriate technology transfer that emphasized choices that were small-scale, environmentally friendly, technologically sophisticated but simple in design (Landauer and Kintsch 2015; Azelvandre 1994). In 2015, with a sudden influx of new faculty, Elder and Crook established a weekly research lunch to welcome them and encourage collaborative research in an academic environment that mandated both a heavy teaching load and an emphasis on research.

In one of the weekly interdisciplinary conversations that resulted, GREA faculty learned about Samarakoon's work on hydroponic lettuce production in Sri Lanka where she tested the viability of hydroponic techniques as compared to field production in drier regions. The researchers found that under high temperature growing environments hydroponic crops need a lower fertilizer rate (Samarakoon 2006; Samarakoon, Weerasinghe, and Weerakkody 2006). This meant that in tropical conditions, the team achieved better yields in hydroponics as compared to field production using less fertilizer. Recognizing the value of these research findings for GREA, Elder, Crook, and Samarakoon saw the potential for applying this project in Ghana. In Sri Lanka as in Ghana, farmers have two common challenges: accessing farmland and relying on rainfall for production. Hydroponics meets both challenges with its small footprint and minimal water needs.

To address food security concerns, to deliver education to their students, and to develop an opportunity for interdisciplinary research, the group devised a project that had both educational and technical objectives. The overall aim of the education components of this two-continent hydroponics project was to introduce students to the instructional methodology of PBL.

The educational objectives were to:

1. Use PBL to improve food security;
2. Promote undergraduate research;
3. Collaborate across curricula and programs;
4. Promote student interaction and teamwork;
5. Develop leadership skills.

The overall aim of the technical component was to build a low-input, low-cost, stationary hydroponic system and introduce this technology to Ghanaian farmers.

The technical objectives were to:

1. Assess the feasibility of producing leafy vegetables similar to African cultivars in hydroponics;
2. Predict and ameliorate changes in nutrient and water requirements during the growing season;
3. Successfully transfer the technology to Ghanaian farmers.

During autumn 2016 and spring 2017, undergraduates in Horticulture Technology (HORTTEC) 2189T Greenhouse Management Practicum; General Communication (GENCOM) 1201T Exploring Agricultural Communication, Education, and Leadership (ACEL); Community Leadership (COMLDR) 2530 Introduction to ACEL; and Food, Agriculture and Environmental Sciences (FAES) 3797.02 Ghana Research and Education Abroad (GREA) collaborated to develop, implement and test a hydroponics system. After testing the productivity of this system under controlled climatic conditions, the next step was for the GREA participants to transfer this research to Kpenoe, in the Volta Region of Ghana, where farmers would implement this system in their family compounds.

Materials and Methods

The PBL project sought to develop students as researchers, teachers, community leaders, and problem-solvers through collaboration with experts in greenhouse food production. The PBL methodological approach included faculty lecture, peer teaching, group discussions, group development activities, applied greenhouse production, and international extension outreach. Like other PBLs, students directed their learning at every point. We will discuss below how faculty members assessed student learning acquisition in multiple ways, such as observations, discussions, presentations, and reports, culminating in the successful completion of the applied research and extension project.

The PBL was implemented in two phases. During the first phase from fall 2016 to spring 2017, faculty members, greenhouse management students, ACEL, and GREA students investigated the feasibility of using stationary hydroponic production for leafy green vegetables in the Ohio State ATI greenhouses.

Phase 1. Samarakoon and her greenhouse students introduced basic greenhouse methods to Crook's 40 first-year ACEL students. First, to align with the system materials available in Ghana, the group identified and procured commercially available supplies rather than using standard greenhouse propagation materials and hydroponic systems. Second, using craft foam as a planting medium, students sowed a well-researched control crop, lettuce. As test crops, they chose spinach, watercress, and collard greens because of their similarity to African cultivars. Third, students prepared the 20 2' x 3' x 8" (60 x 90 x 20 cm) plastic totes by sanitizing them and cutting seven holes in the lid with box cutters. After a two- to three-week germination period, student groups transplanted six seedlings into each tote lid, reserving one hole for stirring the nutrient solution. In each tote, students prepared a nutrient solution of water and Hydro-Gro Leafy Greens, a two-part fertilizer mixture containing macro- and micronutrients.

To better understand the educational and technical

aspects of the crop management process in hydroponics, the students tracked changes in nutrient and water uptake patterns by monitoring pH and electrical conductivity (EC) throughout the growing season. At harvest, groups evaluated the yield by fresh weight. For a subsequent trial, the group transplanted a second crop to determine the potential cost-savings and efficacy of reusing the nutrient solution.

Following the autumn trials, the GREA team and greenhouse students performed additional iterations through Spring 2017. Students grew four test sets of greens, including kale, African mustard green, watercress, and Malabar spinach. The experimental procedures were the same as in autumn 2016 except that students did not test a second crop in the same solution.

In a parallel aspect of the PBL, the GREA students began preparing to transfer the project to Ghana. Six weeks prior to travel, they established contact with three Kpenoe farmers groups, who had agreed to work on the hydroponics project. They also coordinated with the team's Ghanaian extension officer, Dickson Asase, to purchase and propagate local greens seeds, gboma, and ademe. In the absence of commercial hydroponics fertilizers, Asase recruited a local chemist to prepare the two dry fertilizer mixtures from a recipe comprised of individual nutrient elements. Finding nothing comparable to the plastic totes, Asase obtained local Styrofoam fish boxes and purchased black plastic sheeting for lining them. The technology was simple and required no electricity, which is important in areas where electricity continues to be unreliable. A cost-saving advantage of the system design was that farmers could also reuse the boxes and nutrient solution for multiple crop cycles. This advance preparation gave students and farmers the greatest amount of time to work together in technology transfer once the GREA team arrived in Ghana.

Phase 2. Learning from the successes and failures of the trials under controlled conditions in the Ohio State ATI greenhouses, Elder and Crook led the GREA participants to transfer the project to rural Ghana in May 2017. Five of the seven student travelers had worked with the Ohio State ATI trials. Jordan Shaffer, a greenhouse major, oversaw the project. Two Ghanaian farmers, Philippine Buamah and Frederick Erastus, emerged as group leaders. On the third morning in Ghana, Shaffer led the team in a workshop with 30 farmers. Under her direction, GREA students demonstrated the preparation of Styrofoam boxes and the planting process from seed to transplant. The farmers prepared their hydroponics boxes and then, accompanied by the students, fanned out to their family compounds. Once a farmer set her box in its permanent location, the team mixed the fertilizer and water to make the nutrient solution, adjusted the pH and EC as required, and transplanted seedlings.

In the same way that the students had monitored the greens in the Ohio State ATI greenhouses, farmers learned to monitor water, EC, and pH levels weekly. As an important part of the PBL, students wanted to understand whether farmers could continue the project without having access to expensive pH and EC monitors. Twice-weekly, they accompanied students as they made the six-mile circuit to farmers' compounds to measure and record changes in water and nutrient uptake patterns as affected by Kpenoe's hot and humid weather conditions.

In order to assess the productivity of the hydroponic system, farmers agreed to monitor the yield by counting the number of leaves as they harvested them. The GREA team decided to adapt this measurement method because it was more culturally appropriate than harvesting and weighing whole plants as they had done in Phase 1. This shift in measurement helped GREA gather the data they needed for their research while allowing farmers to harvest for home consumption.

In this PBL, faculty checked student acquisition of knowledge at multiple points throughout the project. In Phase 1, students demonstrated their knowledge through in-class group discussions, practical demonstrations, project planning, hydroponic unit design and construction, crop management, record keeping, and data summary. In Phase 2, as in Phase 1, faculty evaluated student researchers while they completed the hydroponic project. Following up after returning from Ghana, the faculty mentored students in research analysis, poster design, and presentation preparation for professional meetings and student research forums.

Results and Discussion

Faculty members assessed student learning acquisition in multiple ways, such as observations, discussions, presentations, and reports, culminating in the successful completion of the applied research and extension project. The primary purpose of this multi-faceted project was to introduce and demonstrate the efficacy of the PBL method for student learning in the areas of interdisciplinary undergraduate research, dry season food production, and transfer of appropriate agriculture technology. To build goodwill and understanding, the faculty designed the experience to foster respectful student-farmer relationships that would lead students to appreciate how cross-cultural interactions and technology transfer can enrich the lives of all involved. They also projected several auxiliary outcomes of developing leadership skills, effective collaboration, clear communication, innovative problem solving, and acceptance of difference.

Phase 1. Development of low-cost hydroponic techniques for Ghana at Ohio State ATI

Autumn trials at Ohio State ATI provided a platform for peer learning because they allowed interaction, communication, and knowledge transfer between HORTTEC, first-year ACEL, and GREA students. A key technological goal of the PBL was for the students to test and identify suitable crops and production methods for low-tech hydroponic systems.

Based on both autumn and spring trials, seed propagation tests on craft foam achieved 90% germination for lettuce, watercress, kale, and collard and African mustard greens. Spinach and Malabar spinach germination proved less successful so the group did not select them for the production trials. During the autumn trial, students harvested lettuce and collard greens as whole heads and watercress twice as the watercress grew rapidly in the system allowing multiple harvests. Lettuce and collard greens had the highest yields (Figure 1A). In the second planting in the same

nutrient solution, students found that the second harvest reduced significantly (Figure 1B). Yield for collard greens was 75% and watercress 50% as compared to the first trial. But, since no additional input is needed, students determined that growing a second crop still offers economic and food security benefits for Ghanaian households. Spring trials allowed both HORTTECH and GREA students to practice the production methods they had learned in autumn. The African mustard greens produced the most (97g); however, kale (62g) also proved to be appropriate for the system. The yield of watercress was 70g and was similar compared to the autumn trial.

Students monitored and recorded nutrient and water changes in the hydroponic systems to determine if pH/EC meters were essential to the project. They found that EC levels fell from 1.8 to 1.5 during the autumn trial, indicating that sufficient nutrients remained in the solution for nutrient uptake throughout the production cycle. Also, pH levels remained stable, 6.5 to 7.5. While the range was not optimal for plant growth, there was considerable yield. Water levels dropped from 28 cm to 23 cm on average requiring no additional water. Based on these results, the students projected that for the Ghanaian farmers, once the crops are planted at the correct pH/EC and water level, they should not need to add nutrient solution or water. Therefore, for best results, farmers need a pH/EC meter for each setup but must at least use a pH meter. Communal access makes this possible.

Figure 1. Average yield of lettuce, collard and watercress grown in hydroponic systems as a first crop (A) and as a second crop (B) in the same nutrient solution, Error bars represent standard error of mean, n=12

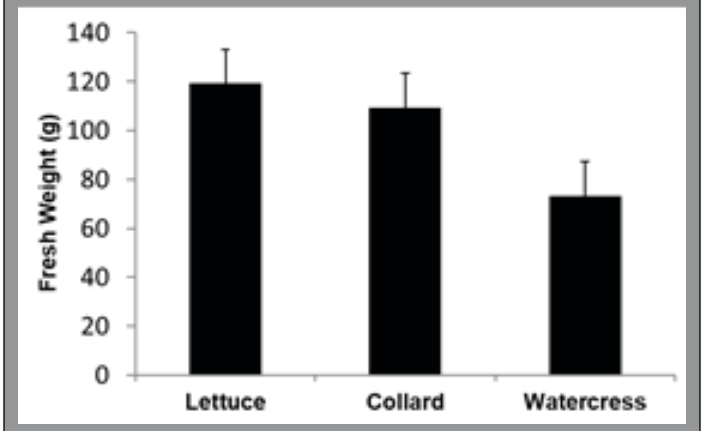

Figure 1a

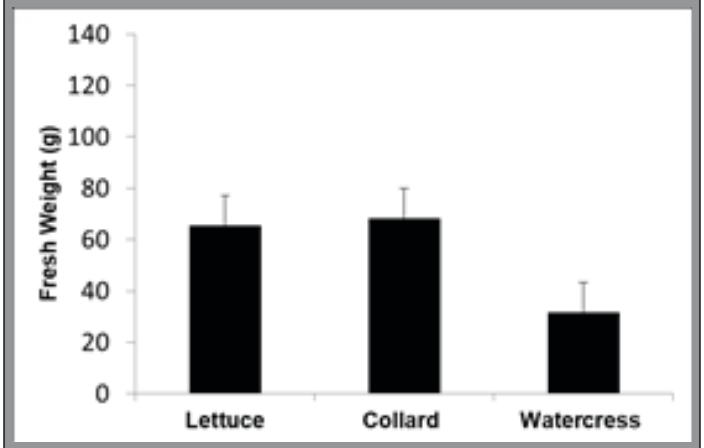

Figure 1b

At the end of this phase, 59 students had learned new hydroponic techniques for watercress, kale, collard, and African mustard greens from sowing to harvest. They developed skills in monitoring and adjusting pH and EC levels in the Ohio State ATI greenhouses. For ACEL students, this project built competencies in PBL development and greenhouse management content, two skills that many of the students will use in their agricultural education classrooms or extension work. The GREA students engaged in guided research with faculty and peers and learned the process, inputs, challenges, and troubleshooting strategies before setting out to implement this project on another continent. HORTTECH students practiced their teaching skills and learned to adapt the technology for application in resource-limited situations. In blogposts, discussion, and journal writing, every student attested that they could apply their disciplines globally to support communities in need.

Phase 2. PBL technology transfer in Ghana, May 2017

Despite all the preparation, GREA students met considerable setbacks in transferring the tested technology to the tropical climate of Kpenoe in the following ways:

- The first crop of seedlings was too young when transplanted. The root systems were underdeveloped and didn't maintain contact with the solution leading to a poor transplant survival rate (14%).
- Styrofoam boxes used as a substitute for the plastic greenhouse totes proved to be surprisingly brittle. Even with plastic lining, the totes leaked.
- For the second crop, farmers set the hydroponic boxes in partial shade to mitigate against high temperature and solar radiation that had further stressed the transplants in the first crop. Nine boxes proved too brittle to hold solution. Eighteen out of 21 farmers (86%) produced crops. Of these, two farmers lost their crops to roaming goats. One farmer noticed significant snail damage.
- A local chemist made nutrient solution chemicals available, but these were expensive for Ghanaian farmers.

Students and farmers persisted. They learned from the failed trial. Faculty members encouraged them with a twist on a maxim often attributed to Albert Einstein, "If it worked the first time, it wouldn't be research."

The second planting succeeded, and Buama and Erastus whose first plantings had survived mentored and aided the others. Farmers expressed appreciation for participating in this scientific approach, collaborating in research, learning about the function and use of a pH and EC meter, and interacting and developing relationships with the students. They agreed they could teach the technology to others if they found it to be beneficial.

Within a week of returning to the United States, students chronicled their observations and experiences about this project. The following comments express the experience of representative students from three majors:

Greenhouse Management major: One week after plant-

Figure 2. Project-based learning enhanced leadership and teamwork while researching food security alternatives.

ing, we went to Kpenoe to check up on the systems only to find that nearly every plant had died. They were too small to handle the intense heat and the stress of transplanting. Jordan and I were devastated. It felt like all our work had been for nothing. But even though that event set us back several weeks, we learned from it and that is the goal of research. When we got back to the hotel, we regrouped and came up with a new plan for the seedlings. We adjusted to the situation at hand and moved on. That was one of the most important things I learned how to do in Ghana-- adjust.

Environment and Natural Resources major: I learned so much from that project--not just researching skills, but valuable people, problem-solving, and leadership and management skills I can apply in any career...Honestly, I needed a confidence boost to take on the world, and it wasn't happening sitting complacent at home.

Sustainable Agriculture major: I found that many people in the Volta Region are fighting for food security against forces like drought, irregular rainfall, and soil infertility, but hydroponics is a way to combat those.

The farmers were able to adapt the technology and make it work for them. After our departure, they continued to monitor their plants. Within six to seven weeks, they harvested crops a few leaves at a time providing a continuous supply of leafy greens for their households.

The project proved surprisingly affordable—in American terms. The total cost for chemicals, box, plastic sheeting, seeds, planting tray, foam, transportation, and some tips for helpers added up to USD 21.87 per farmer. An additional USD 6.66 per farmer purchased one pH/EC meter. Still, in Ghanaian economic terms, the cost would be prohibitive for subsistence farmers. To reduce the costs of materials and transportation while increasing system reliability, the group started looking for alternatives to Styrofoam boxes and commercial fertilizers.

In terms of future implementation, the GREA team observed that the timing of the project occurred out of sync with the agricultural seasons. Ghana has a wet season with two crop cycles and a dry season with limited food production. The annual May GREA trip falls at the beginning of the major wet season when farmers can grow vegetable crops in the field. Introducing this technology during the dry season would have a greater impact in convincing farmers of the economic viability of this food production method. In subsequent trials not addressed in this article, students and faculty built on this preliminary research. The GREA team expects the farmers to find the benefits outweighing the costs.

Through this PBL experience, students and faculty met course-specific educational and technical objectives they set for themselves in the following ways (Table 1).

In addition to the course-specific learning outcomes, all four courses shared common global outcomes of fostering self-development, building community awareness, and engaging in the collaborative process.

Table 1. Course-Specific Learning Outcomes

Course	Learning Outcomes
HORTTEC 2189	• Diversify US hydroponic crop production systems • Identify challenges in running low-tech hydroponic systems
GENCOM 1201T, COMLDR 2530	• Learn research methods in greenhouse and hydroponic crop production • Apply research to the agricultural classroom and extension services
FAES 3797	• Translate hydroponic technology from controlled to uncontrolled settings • Identify crop production issues during technology transfer

Summary

Through an interdisciplinary Project-Based Learning initiative spanning more than an academic year, faculty and students accomplished the goals of the academic triad of engaged teaching-research-service. First, the faculty-initiated and student-led project involved undergraduates in research to address food security issues in Ghana's Volta Region and focused students' attention on understanding and solving a real-world problem. Second, the project built teamwork, networks, and collegiality among entering undergraduates, and between newly hired and tenured faculty members. Third, it taught valuable greenhouse skills to agricultural education and horticulture majors and piqued their interest in engaging in further projects. Fourth, it helped recruit and prepare travelers for the GREA program. Fifth, several HORTTECH majors were able to explore and expand their teaching and leadership capabilities when they collaborated with and provided assistance to other students.

Overall, the PBL consisted of multiple projects that met a variety of discipline-specific learning outcomes and introduced a real-world, international, problem solving, food

security experience to the classroom. Moreover, interdisciplinary collaboration expanded the ability of participants to research complex problems, exchange expertise, and transfer agriculture technology. This joint PBL effort helped faculty members meet their workload expectations and build trust, friendships, and work satisfaction. The mutually rewarding experience assures that GREA will undertake similar projects in the future.

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Mixed-Method Approach for Assessing Student Engagement and Learning for an Interdisciplinary, Multi-Institutional Course

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Abstract

Developing curricula for graduate students in an increasingly globalized world requires unique practices and implementation along with detailed evaluation. In this mixed-method design study, students enrolled in a grant-funded distance, asynchronous course titled Global Horticulture and Human Nutrition to Enhance Food Security and Community Resilience (NEXUS) responded to guided questions in weekly reflection journals throughout the semester. They also completed pre- and post-knowledge assessments at the beginning and end of the semester. Using the Knowledge, Attitudes, Skills, and Aspirations (KASA) framework and Bloom's Taxonomy of the Affective Domain to guide data analysis, key themes in student narratives were identified, such as exposure to new ideas, future career benefits, and global and political connections. Knowledge and learning themes from student reflective journals included exposure to new ideas and concepts, increased understanding, positive learning experience, interdisciplinary application, and global and political connections, and these findings supported the results of increased knowledge gain determined in the pre- and post-assessment from the course. Emergent themes from Bloom's Taxonomy of the Affective Domain included knowledge connection, future career benefits, desire to give back, and behavior change. We recommend using a mixed-method design to form a holistic understanding of student experiences in first-year courses employing novel instructional techniques.

Introduction

Assessment is a critical component of higher education. It can take the form of student knowledge assessment or student development assessment (Astin and Antonio, 2012). Assessment and evaluation are key to determining whether students' needs are met through a course. Assessment was defined by Astin and Antonio (2012) as "the gathering of information concerning the functioning of students, staff, and institutions of higher education" (p. 3). One goal of higher education institutions is excellence in teaching, so evaluations of student experiences, perceptions, and knowledge give instructors important insights (Lang et al., 2010). High grades and student development are two modes of determining excellence in the classroom (Astin and Antonio, 2012). Grades can be assessed through quizzes, tests, and writing assignments.

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Development is more difficult to demonstrate, especially in an online platform. It is important to bridge the gap between what instructors expect students to gain from the course and students' actual learning and development, especially in an interdisciplinary, multi-institutional course (Howland and Moore, 2002). The field of evaluation and assessment is composed of many methods and paradigms (Greene et al., 1989). Some practitioners are diametrically opposed to different paradigms, choosing to stay in the qualitative or quantitative field. Yet, examination from multiple perspectives and through several methods can help evaluators better understand the outcomes and experiences of those involved in a program. Evaluations should be predicated on the specific mission of the program—that is, intended outcomes, goals, desired participant experience—and used to develop an evaluation plan (Astin and Antonio, 2012). For educational purposes, it is imperative to analyze the student experience, to determine learning outcomes and to understand what can be improved in the future, to better the program year after year.

Assessment and evaluation are designed to help improve decision-making, which requires causal reasoning (Astin and Antonio, 2011). Thus, evaluation results are most valuable when they demonstrate the causal connections between educational practice and educational outcomes. Analysis of student reflective journals can help educators discover the presence or absence of reflective thinking (Wong et al., 1995). Assessing these narratives provides evidence for whether students are reflecting on their learning and determining the presence of critical thinking. Student reflections serve a dual purpose: educators can evaluate the level of student learning as well as gather feedback about their performance to improve the program. This type of feedback mechanism is important for self-sustaining and self-transformative educational systems (Schön, 1973).

This study gathered data through two methods: a pre- and post-knowledge assessment and weekly student reflections. Students enrolled in an asynchronous course titled Graduate Studies at the Nexus of Global Horticulture and Human Nutrition to Enhance Food Security and Community Resilience (NEXUS) during the Spring 2018 semester were assessed. This course was grant-funded and consisted of fourteen lessons, each taught by one or two professors (10 instructors total) from three different universities. Because this course was unique in structure, it was important during the pilot year to use a comprehensive investigation of the student experience allowing for both formative and pseudo-summative evaluation techniques. Formative evaluation refers to information collected during the formation and implementation of a program to allow for revisions (Flagg, 1990), while summative evaluations provide a final assessment of the program at its termination (Gardner, 2012). For this study, summative evaluation refers to the termination of the pilot year of a three-year grant project. The weekly reflections posed questions about student perceptions of teaching methods and how the lessons related to their graduate program of study. By understanding student perceptions of the weekly lessons, educators in the course could make immediate corrections to improve the student experience. These reflections also provided feedback for improvements for the course.

This study builds upon previous research regarding mixed-method educational evaluation designs. Mixed-method designs are beneficial for all programs, especially those funded by federal grant dollars. These comprehensive designs can produce better and more all-encompassing conclusions and recommendations for the program (Chatterji, 2004). As governmental agencies and higher education associations become more interested in assessment and evaluation, it is important for evaluators to continually improve and strengthen their evaluation and assessment procedures (Astin and Antonio, 2012). Comprehensive evaluations can increase the transparency and accountability of funding recipients and improve reporting to funding agencies.

This article examines the results of two methods of gathering data from students and attempts to make connections between the two forms of evaluative assessments. It assumes that mono-method evaluations can be limiting when trying to explore the dynamic context of student experiences during a pilot year of a course with a new and unique structure. This approach is one attempt to further the scope of evaluative research in higher education.

Mixed-Method Design in Evaluation Research

The perspective of methodological pluralism in the applied social sciences can beneficially expand the purview of evaluation (Greene et al., 1989). A method, at its most basic level, is a procedure or process for data collection and analysis. Mixed-method inquiries use a combination of methods meant to gather distinct types of data. Qualitative and quantitative paradigms offer helpful perspectives for ways of knowing and understanding, but methods are not inextricably tied to one particular paradigm (Bednarz, 1985; Greene et al., 1989; Reichardt and Cook, 1979). Mixed-method approaches aim to more fully understand a certain phenomenon by generating deeper and broader insights and developing knowledge from a wider range of interests and perspectives (Greene et al., 1989).

Generally, in mixed-method studies, quantitative methods analyze numbers, while qualitative studies analyze words (Greene and Caracelli, 1997). Of the five purposes of mixed-method evaluations defined by Greene and Caracelli (1997)—triangulation, complementarity, development, initiation, and expansion—this study implemented an expansion design, in which multiple components are used in a study to expand the scope of an evaluation. In expansion evaluations, quantitative methods generally assess program outcomes, while qualitative measures assess implementation. The underlying motivation for many expansion studies is to produce a comprehensive evaluation, and this is achieved through the convergence of different paradigmatic modes (Greene and Caracelli, 1997).

Reflective Learning as a Form of Program Evaluation

Reflective learning is important in higher education curricula (Bourner, 2003). Educators are aware of the need to create lifelong learners who can sustain the pace and impact of technological, economic, and social change.

Reflection helps turn experience into learning, helping students react to and conceptualize emergent themes from course materials in order to apply them to their lives (Boud et al., 1985; Bourner, 2003). When students develop their capacity for reflective learning, they simultaneously develop their capacity to learn how to learn. Reflection helps students to turn the experience into learning, in this case learning that is emergent rather than planned (Bourner, 2003). By developing these capacities for understanding the meta-learning process, students can develop skills to enable them to be lifelong learners.

Reflective learning is the "process of internally examining and exploring an issue of concern, triggered by an experience, which creates and clarifies meaning in terms of self, and which results in a changed conceptual perspective" (Boyd and Fales, 1983, p. 100). The changed conceptual perspective, a component of behavioral change as described by Rockwell and Bennett (2004), involves changing a participant's meaning structure (Boyd and Fales, 1983; Lerner and Busch-Rossnagel, 1981). Generally, reflective thinking and learning occurs in two stages: 1) students review past experiences, and 2) students determine what to do with what has been recalled (Bourner, 2003). Students may engage in surface learning, in which they uncritically accumulate facts and opinions, or they could experience deep learning, where they engage in critical thinking and ask searching questions (Stedman and Adams, 2012). Assessing student reflections allows educators to determine how students internalize information and helps them anticipate what the students will do with this new information.

KASA Change Framework and Bloom's Taxonomy in Evaluation

Rockwell and Bennett (2004) defined the role of knowledge, attitudes, skills, and aspirations (KASA) in influencing the adoption of practices or technologies aimed at achieving specific social, economic, and environmental outcomes. KASA changes refer to practice changes that occur as people increase and accumulate knowledge, modify attitudes, improve and build new skills, and raise aspirations, which they then apply to their living and working contexts. These changes occur because of participation in a program, activity, or course, as exhibited in this study. As participants apply these changes to their lives and work, adoption of the target practice or technology takes place. Participation alone does not contribute to adoption. Participants must react positively to their involvement in the activity (Rockwell and Bennett, 2004). These positive reactions, including interest in and engagement with activities, assist in participant acquisition of the desired KASA changes.

KASA changes operate in a hierarchical manner—first, a participant acquires knowledge, which can affect their attitudes toward the subject; second, the participant acquires new skills if they apply the subject practically, which leads to a change in aspirations (Drechsel et al., 2001). Knowledge gain refers to learned information, as well as comprehension of principles and decision-making processes (Rockwell and Bennett, 2004). Skills, conversely, represent the individual's ability to use new practices. For the purpose of this study, the researchers categorized knowledge and skills together. The second category consisted of attitudes and aspirations, the other two aspects of the KASA framework. Attitudes include an individual's beliefs, opinions, emotions, or perspectives, while aspirations relate to an individual's ambitions, hopes, desires, or goals (Rockwell and Bennett, 2004). Even though the KASA framework operates within a hierarchy, the words and phrases attributed to knowledge and skills, and attitudes and aspirations, are similar and difficult to distinguish on an operational level, when participants are not trained in understanding how the KASA framework applies to their reflections.

Human characteristics are difficult to assess due to their intangible and abstract nature (Drechsel et al., 2001). For this reason, the researchers decided not only to combine qualitative and quantitative measures, but also to analyze the qualitative data through two lenses. The first lens, the KASA change framework, allowed the researchers to categorize student perceptions. The second lens used Bloom's Taxonomy affective domain. By using a two-tiered approach to code for emergent themes, the researchers gained significant insight into the level of learning and application anticipated by the students.

Bloom's Taxonomy is a hierarchical, multi-tiered model that classifies thinking into differing levels of complexity (Forehand, 2011), ranging from the concrete to the abstract (Krathwohl, 2002). Bloom's model consists of three domains: the cognitive, or the knowledge-based domain, the affective, or the attitudinal-based domain, and the psychomotor, the skills-based domain. This study utilized the affective domain, defined as the manner in which people interpret things emotionally, such as feelings, values, enthusiasms, motivations, and attitudes (Krathwohl et al., 1973). This domain consists of five categories, starting with the simplest to the most complex—1) receiving phenomena, 2) responding to phenomena, 3) valuing, 4) organization, and 5) internalizing values. Bloom's hierarchy can be used to provide a guiding framework for initial investigation into data to better understand and assess student levels of learning—surface or deep learning—and can help highlight participant KASA changes.

Purpose and Objectives

The purpose of this study was to examine student engagement and learning through a mixed-methods approach. The following questions guided the qualitative portion of the study: (a) What changes in student knowledge, skills, attitudes, and aspirations (KASA) resulted from participation in the course? and (b) What evidence can be observed from Bloom's Taxonomy of the Affective Domain in student responses?

Researchers quantitatively analyzed students' demonstrated changes in knowledge through data generated by a pre- and post-knowledge assessment. The main objective guiding this portion of the study was to determine students' changes in knowledge because of course participation.

Methods

The University of Arkansas and Texas A&M University Institutional Review Boards approved the study protocol and all participants were provided written informed consent prior to participation in the study. This study implemented a mixed-method approach to evaluate the complex student experience in this course. The combination of methodologies allowed the researchers to qualitatively evaluate student emotions in the affective domain and their perceived changes in knowledge, skills, attitudes, and aspirations (KASA), and compared this data with their quantitatively demonstrated knowledge changes. Assessing student experience in a course is complex and multidimensional, so the researchers utilized these complementary approaches to construct a comprehensive understanding of both the perceived and demonstrated student experience.

The authors used multiple modes of analysis for the student reflection journals, derived from Bloom's Taxonomy of the Affective Domain (Bloom et al., 1956; Krathwohl et al., 1973) and the KASA Change Framework (Rockwell and Bennett, 2004), to assess student learning outcomes. Specific feedback for the course were not assessed in this study but provided practical information to program implementers. In addition to the qualitative analysis of student reflections, pre- and post-knowledge tests were used to gauge knowledge gains as a result of the course. When reviewing the reflections cumulatively, as well as examining the knowledge assessments, evaluators and educators can look comprehensively at a course to understand its overall outcomes and understand the holistic student experience.

Students enrolled in the NEXUS course responded to five repeating questions each week to evaluate the lesson. Each student received five points for submitting the assignment on time, once per week for 14 weeks, and one final reflection. One researcher then compiled all responses into a single document for each week's responses, with student responses anonymously listed. This one researcher knew the identities of each student, due to the submission process and grading requirements, but two external evaluators only received anonymized data compilations for analysis. Each student received a pseudonym, "Student + number". Fifteen students completed the course, so pseudonyms ranged from 1-15. The researcher receiving the initial journals also acted as the teaching assistant for the course, hence the initial non-anonymized journal submissions. These documents were distributed between the three researchers for coding based on emergent themes framed within Bloom's taxonomy. Words and phrases were coded as either 1) receiving phenomena, 2) responding to phenomena, 3) valuing, 4) organization, and 5) internalizing values (Krathwohl et al., 1973). The researchers also coded based on emergent themes relating to KASA changes—Knowledge, Attitudes, Skills, and Aspirations (Rockwell and Bennett, 2004). The knowledge and skills themes were categorized together, and the attitudes and aspirations themes were categorized together, because it is difficult to discern action through a reflective journal.

The researchers established trustworthiness based on the recommendations in Lincoln and Guba (1985). To establish credibility, researchers used peer debriefing of the protocol to determine potential bias, as well as prolonged engagement with participants via interactions in the online course. An audit trail and methods triangulation helped to establish confirmability. An external researcher examined the results to establish dependability. Transferability was established through a description of the course in which students enrolled.

In conjunction with weekly reflection journals to monitor student progress continually throughout the course, students completed a pre-knowledge assessment before accessing any course materials, and a post-knowledge assessment after completing the course. The pre- and post-tests intended to gauge student knowledge gained related to the thematic areas of the course—sustainable international development, global horticulture, and human health and nutrition. The pre- and post-assessments were identical and consisted of 42 questions in total. Students received a completion grade of 10 points for taking both assessments, and therefore did not study in the traditional sense for these tests. The researchers selected three questions (one each from easy, medium, and hard question pools) for each lesson (14 total) to compile the 42-question knowledge assessment.

Reliability estimates for the knowledge instrument were determined through Cronbach's alpha. Cronbach's alpha was calculated post hoc to measure the internal consistency and was found to be 0.992. A threat to internal validity, attrition, affected this sample—of the original 19 students enrolled who completed the pre-assessment, only 15 students were able to complete the 14-week course. The course enrollment also attributed to low statistical power for statistical conclusion validity—this being a pilot year for the graduate course most likely contributed to the small enrollment size. Each instructor, identified as an expert in their field, provided a pool of questions from which three were selected to create the instrument, and then a panel of experts in horticulture, agricultural communications, and instructional design determined face and content validity of the instrument.

Results

Student Knowledge Pre-and Post-Test Scores

This research sought to compare student's pre- and post-test content knowledge scores. A paired-samples t-test was conducted to compare the means of the pre- and post-tests of students enrolled in the course. There was a significant difference between the pre-test knowledge scores and post-test knowledge scores $T(14) = 4.42$, $P < .001$ (see Table 1). Additionally, a large effect size of 2.18 was found (Cohen, 1992).

Table 1. Overall Paired Samples t-Test Comparing Pre- and Post-Test Knowledge Scores

Source	M	SD	df	t	p	d
Pre-Test	24.86	2.48				
			13	9.03	<.001	2.18
Post-Test	32.57	4.35				

Note: p is significant at the .05 or less value.

Pre- and post-test knowledge assessments were comprised of questions from three broad content areas. Those included: a) sustainable international development, b) human health and nutrition, and c) global horticulture. Table 2 contains paired-samples t-tests for each content area. The largest knowledge gain was seen in the global horticulture context area.

Table 2. Paired Samples t-Tests Comparing Pre- and Post-Test Knowledge for Each Content Area

Sustainable International Development						
Source	**M**	**SD**	**df**	**t**	**p**	**d**
Pre-test	**5.57**	**1.70**				
			13	**2.14**	**.052**	**.77**
Post-test	**6.71**	**1.2**				
Human Health and Nutrition						
Source	**M**	**SD**	**df**	**t**	**p**	**d**
Pre-test	**8.86**	**1.61**				
			13	**8.13**	**<.001**	**1.39**
Post-test	**11.50**	**2.14**				
Global Horticulture						
Source	**M**	**SD**	**df**	**t**	**p**	**d**
Pre-test	**10.43**	**2.07**				
			13	**6.06**	**<.001**	**1.86**
Post-test	**14.29**	**2.09**				

Note: p is significant at the .05 or less value.

Student Reflections on Course Structure and Learning

Researchers analyzed student narratives based on Bloom's taxonomy and KASA changes, while simultaneously noting emerging themes between student reflections. Themes relating to knowledge and skills comprised one category, while those relating to attitudes and aspirations comprised the second. The researchers chose not to make distinctions between knowledge/skills and attitudes/aspirations because the data did not provide enough distinct content to adequately separate the related categories. The following paragraphs detail individual student voices as well as emergent themes from the reflective journals. The majority of student reflections were specific to each week's lesson, but overall themes have been extracted from students' weekly and final reflections.

Knowledge/Skill

Students frequently commented on the comprehensive nature of the course, such as the comment by Student 15 on the inclusion of health, nutrition, and horticulture. The interdisciplinary approach helped students make connections across context areas. Exposure to agricultural principles and practices, such as preventing food loss and perishability as well as food security and insecurity helped students gain an increased understanding of nutrients, sustainable farming practices, food health, and safety. Many students were introduced to change theory with the concept of change agents and how they help communities with adopting new innovations (Student 3 and 4). Learning about community stakeholders and non-government organizations (NGOs), such as the United Nations, the Food and Agriculture Organization, and the United States Agency for International Development, contributed to a holistic understanding of concepts and knowledge gained in the course (Student 1). Overall, students indicated a significant amassing of new concepts and knowledge as a result of the NEXUS course.

Emerging Themes Related to Bloom's Taxonomy

There were several emergent themes discovered in the reflections, including exposure to new ideas and concepts, increased understanding, positive learning experience, interdisciplinary application, and global and political connections. Several topics in particular "opened [their] eyes" (Student 10) to concepts and phenomena outside their field of study, which corresponds to Level 1 of Bloom's taxonomy (receiving phenomena). Students noted that several modules helped them gain a "better understanding" (Student 3) of food security, sustainable development, and horticulture, and the critical needs of low-income and developing countries (Student 4). Researchers identified these phrases as belonging to Bloom's second level, responding to phenomena. Phrases such as "enjoyed learning" (Student 2), "positively affected my learning" (Student 4, 5, 6, 9, 10, 11, 12, 13, and 15), and "enlightening" (Student 4) were commonly seen in the reflections. These phrases were identified as valuing based on Bloom's taxonomy, the third tier of the hierarchy.

Several themes represented Bloom's fourth level, organization. Some students expressed that course modules offered them new perspectives on how to apply their field of study in an interdisciplinary context (Student 4, 11, 15). Several students stated that the course helped them build on previous knowledge (Student 3, 11, 13), as in a representative statement by Student 11, "I can now understand what I am doing for research and [how] the skills I am learning could be implemented in international agriculture development." Other students explained that

Table 3. Emergent Themes Relating to Knowledge Skills	
Emergent Themes	Representative Words and Phrases
Exposure to new ideas and concepts	"opened [their] eyes"
Increased understanding	"better understanding" "build on previous knowledge" "understand what I am doing for research" and how it "could be implemented in international agricultural development" revealed gaps in knowledge helped identify previous misconceptions
Positive learning experience	"enjoyed learning" "positively affected my learning" "enlightening"
Interdisciplinary application	comprehensive nature of the course through inclusion of health, nutrition, and horticulture how to apply their field in interdisciplinary context
Global and political connections	see and think through global perspective political insight into what needs to be done understand critical needs of low-income countries

the NEXUS course helped them reveal gaps in their previous knowledge and conceptions about topics covered in the lessons (Student 2, 5, 6), while others built on this information further by stating that the lessons helped them identify previous misconceptions and correct them (Student 5). Many students stated that the course helped them see and think through an increased global perspective (Student 2), reflecting Level 5, internalizing values. Another concept that reflects Bloom's fifth level included political insight into what needs to be implemented (Student 2, 8, 10, 15). Table 3 contains a complete list of emergent themes regarding knowledge/skills.

Attitudes/Aspirations

Researchers categorized words and phrases that directly reflected emotion, beliefs, and values for changes in attitudes and aspirations according to Rockwell and Bennett's (2004) definitions of KASA changes. An important concept found in the reflections was the reporting by some students indicating behavior changes. One student directly shared information and course materials with a colleague in Extension (Student 6). Another student stated that they changed their eating habits as a result of one of the lessons on fruits and vegetables (Student 10). Students began to understand the implications of cultural sensitivity in their respective fields of study, especially Extension, and wanted to use this knowledge in future research and career pathways (Student 4).

Emerging Themes Related to Bloom's Taxonomy

Several themes emerged reflecting students' attitudes and aspirations about and as a result of the course, including knowledge connection, future career benefits, desire to give back, and behavior change. Some students directly connected concepts from the lessons to their current and future research projects (Student 1, 2, 5, 6, and 12). Others expressed that the course would be beneficial in their future work with international project management (Student 3 and 4) and Extension work (Student 6). Others identified aspects of career development, stating that they "hoped to use [these concepts] in their future career" (Student 8). Several students described a desire to help those in need using innovative thinking methods generated through the course to connect multiple disciplines to solve complex global problems (Student 8). Students expressed a variety of sentiments about changes in their attitudes and aspirations as a result of the course, which is an important aspect of Rockwell and Bennett's (2004) KASA change framework. Table 4 contains a complete list of emergent themes regarding attitudes/aspirations.

Table 4. Emergent Themes Relating to Attitudes/Aspirations	
Emergent Themes	Representative Words and Phrases
Knowledge connection	connect with current and future research projects
Future career benefits	understanding cultural sensitivity as it relates to field of study plan to use knowledge in future career helpful for future work in international project management/Extension work "hope to use [these concepts] in their future career"
Desire to give back	help those in need with innovative thinking methods and interdisciplinary action
Behavior change	comprehensive nature of the course through inclusion of health, nutrition, and horticulture how to apply their field in interdisciplinary context
Global and political connections	shared information and materials with colleague changed eating habits

Summary

When comparing the results from the pre- and post-knowledge assessment with the knowledge and skill gains detailed in the reflection journals, it is clear that students both perceived and demonstrated knowledge gains. Students demonstrated increased knowledge gains in the global horticulture content area from the assessments, which may be due to a large number of horticulture students having been enrolled in the course. By using this dual-analysis approach, the researchers were able to contextualize data from the reflection journals by understanding the knowledge gained noted in the assessments. If students were commenting on perceived knowledge gains, but the assessment data clearly demonstrated no change in knowledge or a negative change in knowledge, then researchers would not be able to confidently classify perceived knowledge gains and report them accordingly. This dual analysis provided quantitative data to support and expand upon the qualitative data, to provide in-depth insight into the student experience. The qualitative analysis examined student perceptions of knowledge, skills, and attitude changes derived from the course, and the quantitative analysis provided concrete evidence for knowledge changes. Framing student reflection analysis within the KASA framework is helpful when comparing data to knowledge assessments. One cannot examine attitude changes through a knowledge assessment, so reflective journals can expand upon the holistic changes for the student as a result of a course or program.

Results from this study demonstrated evidence from all five levels of Bloom's Taxonomy of the Affective Domain, indicating that course material evoked various complex responses from students. This is important in a graduate-level, multi-disciplinary course focused on sustainable international development, global horticulture, and human health and nutrition. Rich and complex course materials should challenge thoughts and perceptions of students and by using Bloom's Taxonomy to analyze the reflective journals, the researchers were able to determine the presence of high-level thinking.

Because students were not required to actually study for the final assessment, grades do not reflect a traditional final as they would in other courses. By allotting the students completion grades for this assignment, the researchers intended to minimize the risk of involvement in the research, as well as gauge a true reflection of internalized knowledge gains from the course. Student 1 reported initial hesitancy about completing the reflection journals for fear of retribution in grading but overall felt that they were helpful assets to an asynchronous course.

Using student weekly reflections in conjunction with a quantitative pre- and post-knowledge assessment allowed instructors to monitor both overall student progress and student progress during the implementation of a new course. In newly created online courses, student reflection journals allow for a pseudo-formative evaluation of the course to make corrections immediately to cater to student needs. Student 12 noted that the weekly journal reflections allowed students to have a "voice" and to feel heard. This method is especially helpful in online courses when student-teacher interaction is minimized. It allows instructors to understand different characteristics of the students, even those with whom they have never had face-to-face contact. These types of reflections allow for increased interaction and potential-relationship building between instructor and student, which can add depth to a course and encourage increased student engagement. Reflection journals, while providing insight into some knowledge gains and perceptions, also contribute to creating a meaningful and holistic course atmosphere for instructor and student.

Formative evaluation measures, interpreted through the recommendations made by students in their journals, informed changes to be made both during the semester and for the subsequent semesters. Mid-semester changes included reevaluating quiz grades after determining questions that were not adequately explained in lecture materials. Subsequent changes that were made to the course based on recommendations by students included content area reflective narratives, in lieu of weekly reflections, and introductory videos created for each module. These changes allowed for increased flow between course content and a more appropriate delivery style for an asynchronous online graduate-level course.

When developing interdisciplinary, multi-institutional online courses, it is important to utilize mixed-method approaches to meet the needs of diverse students from different academic backgrounds. These complementary approaches allow educators to create a meaningful and holistic understanding of student perceptions and experiences as they relate to learning outcomes. Continual assessment of a course allows educators to determine whether students are receiving the necessary resources for their learning needs. According to Astin and Antonio (2012), assessment results are most valuable when they allow educators to draw conclusions about causal connections between educational practice and its outcomes. Following the advice of Schön (1973), it is imperative for institutions to be self-sustaining learning systems capable of their own transformation in response to student needs. The approach described in this study is one mechanism for achieving this and other types of excellence in higher education (Lang et al., 2010).

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Engaging Students in Global Agriculture in a Writing-Intensive, Contemporary Issues Course

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Abstract

This contribution describes a contemporary issues course (AGRI 3372[WI]) that has a strong global component. Since 2011, the course has been taught to mostly Animal Science majors; however, it is now a requirement for other agricultural majors. As a designated writing-intensive course it can substitute for a technical writing course. The course objective is: students will learn the basis of major global issues that relate to food production, use of appropriate technology, and the role of domesticated animals and plants in promoting food security across diverse cultures. The textbook, Contemporary Issues in Animal Agriculture, by Peter Cheeke, serves as a guide. In addition, globally-relevant materials and PowerPoint-based lectures are used that include updated information from recent research reports, books, and other sources, including links to short videos and websites. Furthermore, students are introduced to world-renown scientists and key international agencies and organizations. A Blackboard course site has also been developed. Examples of global materials used in the course are provided in this paper. In class, students regularly write short essays that are expected to reflect a global perspective. In conclusion, engaging students in a contemporary issues course, with globally-enriched content, likely contributes to a deeper understanding of contemporary issues in agriculture.

Introduction

In recent years, Animal Science programs at U.S. institutions have added Contemporary Issues to their departmental curriculum, usually as a required course in the student's degree plan (Stephens and Schmidt, 2004; Swanson, 1999). Generally, the course addresses contentious issues relating to agriculture, whereby the course objective is to improve student's awareness or knowledge and critical thinking ability. In this vein, Contemporary Issues is suitable to develop into a writing-intensive course. According to Leggette et al. (2015), "writing is one way of understanding complex information" (pages 280-281), especially when there are many short writing assignments and opportunities for multiple revisions (Orr, 1996). In addition, Aaron (1996) reported that a Contemporary Issues course also lends itself well in program efforts to have students write across the curriculum.

In teaching such a course, an opportunity exists for the professor to deliver the topic in a global context. For example, the use of artificial growth hormone is a controversial issue in the U.S. in terms of public perception, but what really is the basis for the European Union and other countries to ban U.S. beef? Is it a political or scientific-based decision? The animal rights movement has been effective in deterring certain livestock production practices in industry (although certain positive changes have resulted as a consequence), but how have governments and industries in other countries dealt with this social confrontation? This global consideration offers valuable insight in terms of how the U.S. government and animal industry has either already or should respond. Providing a strong global dimension to the course undoubtedly requires more preparation time, but the reward is a deeper level of understanding of the issue, and enhancement of critical thinking skills on the part of the student.

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Purpose and Objectives

The objective of this contribution for this special NACTA journal issue on "Engaging Students in Global Agriculture," is to describe the developmental process and share experiences in teaching students a course on Contemporary Issues with a strong global dimension.

Methods

Course Background

The mission of Texas A&M University-Kingsville (TAMUK) is to develop well-rounded leaders and critical thinkers who can solve problems in an increasingly complex, dynamic, and global society. In 2010, the Texas Board of Higher Education (TBHE) mandated that state institutions of higher learning would require students to enroll and complete a globally-orientated course pertaining to their discipline or major, as well as comparing systems of ethics and morality in different cultures. In response, colleges and departments across the TAMUK campus created "Global Issues" courses for General Education credits. Because of the author's experiences of working in about thirty lesser developed countries and teaching of the course: International Animal Agriculture (Lukefahr, 1999), he was asked to develop and teach this new course.

The original course catalogue description was: "Overview of the role of agriculture in a global society. Students will be exposed to critical issues that affect world food production across diverse cultures." In addition, the original course objective from the syllabus was: "The student will learn the basis of major global issues that relate to food production, use of appropriate technology, and role of domesticated animals and plants in food security across diverse cultures. Critical thinking ability and oral and writing skills will be enhanced through regular classroom assignments and discussions."

In 2011, AGRI 2372 - A Global Agricultural Society was first offered. Eleven Animal Science students enrolled in this first class. However, the following year TBHE decided to drop this mandate to reduce the total number of credits required for graduation. Despite this decision, departmental faculty felt that the new course offered real value to student learning in a global context. A proposal was submitted to TAMUK's University Curriculum Committee, and later was approved by the Provost's office that this would become a required course for Animal Science majors. Later, other Agriculture majors within the college would also be required to take this course.

In 2016, a proposal to offer AGRI 2372 as a writing-intensive course was submitted to the Writing Intensive Committee. This was later approved by the Provost's office. The course number and title were changed to AGRI 3372 [WI] – Contemporary Issues. Writing Intensive courses are intended for students to 1) analyze/think critically and articulate ideas about discipline-specific subjects and 2) communicate effectively in their professions and/or graduate studies. As a 3000-level course, students who earned a C or better final grade would not be required to take ENGL 2314 – Technical Writing. Because of the change from 2372 to 3372, other majors can take the course as AG elective credits towards graduation. In addition, as a designated WI course, students were required to write several essays or other paper assignments throughout the semester for a significant part of their final grade.

Present student learning outcomes (SLO) for the course include: 1) to compare systems of ethics and morality in different cultures, 2) to defend a position either supporting or not supporting a traditional or technological agricultural practices, and 3) to improve the ability to critically develop and articulate concepts and issues through technical writing. The first SLO was retained from the original syllabus to maintain the global theme of the course.

Course Delivery Methods to Provide Global Content

Several methods have been used to increase student's global awareness of contemporary issues as well as to improve their written communication skills. First, the textbook by Cheeke (2004) entitled, Contemporary Issues in Animal Agriculture, has been used since 2011. Ten chapters are covered from the textbook that range in a wide variety of contentious issues. The titles of these chapters, developed into learning modules, are shown in Table 1. Of course, it is recognized that more issues exist that relate to livestock production, such as animal rights and the use of antibiotics, as opposed to crop production. Nonetheless, it was deemed necessary to further expand the course content, where appropriate (e.g., domestication of plants, plant products in the human diet, plant food quality and safety issues, and genetic engineering of plants), to include plant agriculture since students represented other AG majors besides Animal Science.

Generally, the textbook itself already provided some global treatment of contemporary issues, which is one reason why it was initially selected as a textbook for the course. In previous years, PowerPoint (PPT) outlines of class lectures were photocopied and made available to students. In 2017 a Blackboard (Bb) course website was created that included materials such as the syllabus, writing-related documents (e.g., writing policies and a written communication-value rubric), and PPT lecture outline files. Students now had direct access to these materials, as well as links to articles, short videos, websites, etc., that were embedded into the PPT files. Throughout the year these course materials are updated with PPT links to web-based articles, short videos, websites of lectures, organizations, etc. A sample of global-themed books, videos, experts and organizations that are referred to in each of the ten chapter-based course modules is shown in Table 2.

According to the syllabus, grading involved the writing of ten essays, each worth 50 points. At the end of the semester, a discretionary 50 points were also given based on student attendance and classroom discussion participation. On the first day of classes a writing rubric was presented, which was modified from one available at the website of the AACU (2018). It was also expected that the essay would have a global frame of reference.

Specifically, each essay covered an issue over only one chapter-themed module that was covered in class

Table 1. Chapters Covered from the Textbook by Cheeke (2004) and Developed into Learning Modules with a Global-theme*

Chapter	Title	Global Aspect
1	Domestication of animals and their contribution to human welfare	World agriculture history overview**
2	Animal products in the human diet	Dietary trends across cultures**
3	Feed vs. food: Do livestock compete with humans for food resources?	Difference in diets between cultures in developed vs. developing nations
5	Feed additives and growth promotants in animal production	Some compounds are banned in other countries
6	Environmental concerns involving livestock production	World greenhouse gases, pollution of oceans and rivers, etc. **
7	Livestock grazing and rangeland issues	Global overview of abuses in regions (Australia, the Sahel, and Mongolia)
8	Industrialization, corporatization, and globalization of animal agriculture	Global trends and issues**
9	Food quality and safety issues	Global market theme**
10	Bioethics, animal welfare, animal rights, and biotechnological issues	Global emphasis on how issues are addressed in other countries**
11	Livestock integration into sustainable resource utilization	Gaia hypothesis, concept of biosphere, sustainability**

**Cheeke, P.R. 2004. Contemporary Issues in Animal Agriculture. 3rd ed. Upper Saddle River, NJ. Pearson Education, Inc.*
***Issues that include plant agriculture are added to the learning modules and presented in class.*

Table 2. A Snapshot Sample of Books and Videos, Experts and Organizations Introduced to Each Class Learning Module Presentation to Emphasize Global Content*

Chapter	Book (Author) or Video Source	Expert	Organization
1	Smithsonian Institute	John Hodges	Food and Agriculture Organization
2	The Big Fat Surprise (Teicholz)	Richard Wrangham	National Geographic
3	Journey to Planet Earth - The State of the Planet	Lester Brown Thomas R. Preston	Mekong Basin Animal Research Network
5	Ted Talk	Lance Price	European Union
6	Heifer International - Remedies: Healing the Earth	Judith Capper	World Bank
7	Journey to Planet Earth - Seas of Grass	Allan Savory	U.S. Agency for International Development
8	Collapse (Diamond)	Steven Blank	Swedish government case study
9	Omnivore's Dilemma (Pollan)	David Suzuki	World Health Organization
10	A New Basis for Animal Ethics (Rollin)	Normal Borlaug Temple Grandin	UK Farm Animal Welfare Council, Monsanto
11	Diet for a Small Planet (Lappé)	James Lovelock	Heifer International

**Refer to Table 1 for chapter titles and textbook source. Items appearing in the same row are not associated with items in columns (except for the Ted Talk video featuring Lance Price). Listed books are cited in the text and appear in the Literature Cited section. Videos and names of experts and organizations listed are briefly described in the text.*

usually in the previous week. This way, students had less material to recall in articulating their position in writing about a specific issue. In preparation, students could examine a list of sample essay questions from previous years that were posted in Bb (Table 3). Students wrote their essays during the last 45 minutes of class without access to notes. For further guidance, students were encouraged to visit either the professor or a tutor at TAMUK's University Writing Center (UWC) by showing a draft to which feedback was provided. The mission of the UWC is: "to assist fellow writers in all stages of the writing process, from generating ideas to editing and proofreading… We share with fellow writers the tools necessary to improve her or his writing process."

Results

Each of the ten chapters covered from the textbook that addressed a major contemporary issue was used to develop course learning modules. The development of modules for class presentation was enhanced to include aspects of plant agriculture as well as a strong global dimension, as follows. Each module begins with a list of learning objectives that appear on the PPT title slide. The second slide shows a modified list of the major headings from the textbook chapter that will be covered. To these first two slides, photos, maps or figures are typically added to set a provocative global theme. Sometimes a photo(s) is used from the professor's own work experience in lesser developing countries involving livestock development projects, accompanied by a brief personal story to further set the theme for the module.

Domestication of Animals and Their Contribution to Human Welfare

The first chapter is already of a global nature so little effort was needed to further expand or emphasize global content as a learning module. This module begins with the exploration of the origin of humans. A link is provided in the PPT to the Smithsonian Institute's Natural Museum of Natural History (https://humanorigins.si.edu), which was accessed in class. One video features a world expert on anthropology who comments on the evolution of the human species and our migration out of Africa. (This global trek would eventually wreak havoc on the environment, which will be discussed later.) Links to articles from journals or popular magazines (e.g., National Geographic, Nature, and Science) are provided throughout the PPT, which students can access even before the lecture via Blackboard to better prepare and engage themselves for class discussions.

The next topic focuses on the more recent history on the domestication of animals and plants. The textbook content was expanded to include plant agriculture, which was then used to develop the PPT for classroom presentation. A former colleague (C. Simpson) kindly provided PPT slides on plant domestication from her course: PLSS 3332: Plant

Table 3. Sample Essay Questions from Previous Examinations that Reflect Global Content from Each of the Ten Chapter-Modules Covered in the Course*

Chapter	Question
1	What are some other less common livestock species (other than cattle, chickens, goats, horses, sheep, swine, and turkeys) that are important to different cultures around the world? Explain how these species are important.
2	How did the development of Agriculture, which involved the domestication of animals and plants, benefit versus harm humans from a health standpoint? Next, expand your essay to relate to the diseases of Western civilization.
3	Explain by example why there are few cases where direct competition for food exists between humans and livestock in both developed (DC) and lesser developed countries (LDC). In contrast, describe possible examples of where there could potentially be competition for food between humans and cattle, chickens, and pigs.
5	What are antibiotics? Why is the use of antibiotics so controversial? Why has the use of antibiotics in livestock been banned in some countries?
6	Why is slash and burn agriculture such a common phenomenon in tropical forest regions of the world, especially in the Amazonian region? In your opinion, what are some viable alternatives to land that has already been cleared?
7	What were some of the first causes (there were several) that led to present global-scale desertification BEFORE overgrazing by livestock occurred?
8	Provide specific examples of risks concerning food safety of eating local versus eating global.
9	Distinguish between organic beef, all-natural beef, and grass-fed beef. How are they similar? In what cases could they be very different? Why does the European Union (EU) ban U.S. beef? Is this a sound, science-based decision?
10	Is genetic engineering morally wrong? If so, should it be stopped and by whom? Is it moral or ethical to allow people to starve in the world?
11	How does Global Capitalism affect food production? What are the advantages and disadvantages for farmers and consumers? Think along the lines of developing a more sustainable, equitable, and humane culture for the some 7 billion people on the planet.

**Refer to Table 1 for chapter titles and textbook source.*

Propagation. To reiterate, links to articles of interest are added. Students learn of the center of geographic origin of animal and plant species throughout the world and of the advanced cultures who first domesticated these species.

The final topic is on the global contribution of agriculture to human development. In the classroom, short videos are played and links to articles on the subject are accessed and presented, including websites of humanitarian organizations such as Heifer International (https://heifer.org). In summarizing this module, a table is presented in the PPT on the contributions of livestock to human well-being, which is from the article by Hodges (1999) who is a world-renowned animal agriculture scientist from Austria.

Animal Products in the Human Diet

This module resumes the discussion on the evolutionary history of humans and the transition that occurred approximately 2.6 million years ago when our ancestors added meat to their diet to about 1 million years later when humans discovered how to control fire. The combination of being omnivores and of the practice of cooking food yielded more nutrients from the diet, which supports the large-brain, small-gut hypothesis. Students are introduced to the scholarly contributions in these developments by British anthropologist, Richard Wrangham (2009), and other internationally-renowned anthropologists.

The contentious issue herein is about whether animal-source foods promote good vs. poor health. As a backdrop to class discussions, mention is made of certain primitive cultures today (e.g., Eskimo and Masaai) which are largely carnivorous, and who generally enjoy good health and are spared the ravages of modern-day diseases. In the PPT presentation, the professor presents tables from Randolph et al. (2007) on critically-important micronutrients, some of which are abundant in animal-source foods. The tables show estimates of the global population reported to suffer from these deficiencies, typically reflecting poorer populations of people from lesser developed countries (LDCs) who cannot readily afford to purchase animal-source foods.

Animal-source foods are often implicated as direct causes of the so-called Diseases of Western Civilization (e.g., cancer, coronary heart disease, diabetes, obesity, and strokes); however, dietary recommendations by the medical community are not always based on sound scientific knowledge. To illustrate, in an extensive review of the literation in question, Hyman (2016) asserts that present recommendations to reduce fat by various organizations are generally based on studies that only tended to show associations between dietary fat intake and health. This is in contrast to designed studies involving control and experimental groups that demonstrate cause-and-effect relationships. In recent years a growing consensus of such case-control scientific studies has revealed that excess dietary sugar rather than fat is more responsible for the "diabesity" epidemic in affluent societies.

The question emerges: Is meat and other animal-source dietary foods even necessary today to have good health? The answer is clearly no. However, the decision is a personal one whether to be an omnivore or a vegetarian or a vegan. This choice requires specific knowledge and making careful choices of what animal- and (or) plant-based foods should be consumed and in proper proportions to promote good health.

In this chapter, Cheeke profusely cites the international literature involving the results of experimental and case studies that involve a plethora of dietary hypotheses proposed by international scientists and dietary practices across cultures. To illustrate, why do women in rural China compared to women in Beijing have a lower incidence of osteoporosis although both groups consume a similar diet? The professor updated this topic with materials and references to key organizations such as the American Heart Association, National Research Council, and the World Health Organization.

To reiterate, these dietary issues are presented in a global context. Books read by the professor—for example, The Big Fat Surprise (Teicholz, 2014) and Eat Fat, Get Thin (Hyman, 2016)—are brought to class and described to students, which are recommended for reading. Teicholz (2014) thoroughly investigated the literature and personally interviewed leading nutritionists around the world who supported various dietary models, such as the Low-Fat Hypothesis and the Mediterranean and USDA food pyramids. Short YouTube videos featuring Teicholz and other authors are played during class to further engage students, which leads to more thought-provoking discussions. More recent dietary trends, such as vegetarianism and veganism, are presented to better understand the underlying reasons for these trends, which range from concerns over health, animal ethics to the sustainability of the planet. Lastly, for all module PPTs, the professor often adds humorous content to slides. For this module, a show of the Mediterranean, USDA, Vegan, and the Texas food pyramids are compared.

Feed vs. Food: Do Livestock Compete with Humans for Food Resources?

As the title implies, this module examines the question of whether or not there is direct competition for food between humans and livestock at the global level. The answer is an academic one: It depends! In class, students are guided into discussions where they learn that animal production systems are very different between developed vs. LDCs. In the former case, animal production systems largely involve a monoculture where there is no connection between crop and livestock production. Rather, animals are intensely managed on a large scale with an emphasis on economic efficiency. In these systems, the feeding of grain and grain by-products as animal feed (as opposed to food for humans) is very common, which raises both major ethical and environmental concerns in some cultures or societies (Foley, 2014).

In contrast, traditional production systems on small farms in the LDCs typically involve the feeding of agricultural crop residues, garden wastes, and kitchen scraps to small herds or flocks of livestock. Here there is little competition for food. In such systems, integrative practices are common to optimize natural resource utilization with emphasis instead on biological efficiency and sustainability, and with little negative impact on the environment. For example, the integrative use of animal manures as organic matter to

fertilize fields, gardens or fish ponds is common. In effect, food for human consumption is produced at a lower cost.

Then this topic takes a twist in class as students learn that in the LDCs, as a poor family increases their income by one U.S. dollar equivalent, they spend an average of 60 cents to buy food of higher quality, which includes animal-source foods (Cunningham et al., 2005). In other words, people in LDCs generally do not desire to eat mostly grains but wish to add animal foods to their diets. Moreover, as countries rise from developing to developed status, a rise in the number of large-scale animal operations typically occurs. Today, China and India produce and even import grain as feed from other countries to support such expanding animal operations. Generally, the world is awash in grain, and there is enough of grain and (or) grain by-products to feed to livestock. Moreover, people across cultures demand a broader diet that includes animal food products. However, this position mandates a serious discussion on the issue of long-term sustainability and (or) the health of the planet.

Students are exposed to international programs that address sustainability involving alternative and more efficient integrated, small-scale crop- and livestock-based systems that minimize the feeding of food to livestock. One such program is MEKARN which is based in the Mekon region of southeastern Asia (http://new.mekarn.net/). One animal scientist (T.R. Preston) and one environmental activist (L.R. Brown) are highlighted in class. Thomas R. Preston has during his long career published over 3,000 articles on sustainable practices that have been adopted by countless low-income farmers throughout the developing world. In contrast, an article on the controversial use of corn as a source of fuel for automobiles, written by Lester Brown (2006), former director of the Worldwatch Institute, is viewed in class and discussed in the context of how this one practice in the U.S. has affected global hunger and grain prices. To conclude the module, one segment of a video entitled "Journey to Planet Earth - The State of the Planet" (The Public Television Series; narrated by Matt Damon) is shown in class that addresses the question of whether or not there will be enough water and food for future generations.

Chapter 4 is on the topic of basic animal nutrition and feeding of livestock. When Dr. Cheeke taught the course it was offered to all majors and he was compelled to develop and teach this topic to provide some background, being relevant to issues raised in subsequent chapters.

Feed Additives and Growth Promotants in Animal Production

This topic pertains only to animal agriculture. This module is about the controversial issue of using feed additives (especially antibiotics) and artificial growth stimulants in livestock production. First, students gain basic knowledge about feed additives, defined as compounds that are not nutrients but that benefit the animal in terms of performance or health. Next, a list is examined of feed additives that are used in the global animal industry (but mostly in developed countries), as well as their sources and why they are used. For example, certain enzymes, such as beta-glucanase, cellulose, and phytase, are added to the diet to improve feed digestion, which improves animal performance as well as reduces pollution of the environment due to more complete digestion and less excretion of excess nutrients in animal wastes. Students learn that the global use of feed additives is generally safe and effective, except for antibiotics.

The main global concern over antibiotic use is that pathogenic bacteria can gain genetic resistance via mutation. A couple of short YouTube videos are played in class about "superbugs" (Fix Food – Fix Antibiotics) and about the actual case of a hog farmer who developed a chronic disease from being exposed to his hogs that harbored antibiotic-resistant bacteria (a PBS news video: How industrial farming techniques can breed superbugs). The latter video shows a brief interview with Dr. Lance Price who is an epidemiologist at George Washington University. He is an ardent spokesperson for the total ban of antibiotics in animal agriculture. Price also appears in a Ted Talk video that has been shown to students in class in previous years.

Students learn that such cases, as well as scientific evidence, are largely the basis of why there is now a total ban on antibiotic use in livestock production in some countries. The U.S. is heading in this same direction; already those antibiotics used to treat humans are being phased out of the animal industry. Other antibiotics are still in use but no longer promote growth; instead, they are used to prevent disease or to treat sick animals. Moreover, some can only be used under the close supervision of a veterinarian (e.g., Veterinary Feed Directive program).

Artificial growth stimulants are used but only in the commercial beef and sheep industries in the U.S. to increase profits by reducing the number of days or age at harvest, which also reduces the negative environmental impact. However, the European Union (EU) bans meat products from animals that receive artificial growth hormone implants according to the "precautionary principle" (i.e., better safe than sorry until more research has been conducted to protect the health of consumers). Our government claims that this position is purely political. To the contrary, numerous scientific studies report that meat products from implanted animals are safe and pose no health risks. While this and other issues are debated in class, in the end, students are asked to make their own decision. Students also have the opportunity to defend their opinion (based on knowledge as opposed to myths) by writing essays.

Environmental Concerns Involving Livestock Production

For this module, the course content was first expanded to include environmental concerns of crop production. For example, the main cause of deforestation in the Amazonian region is slash and burn agriculture by the poor because of the growing population. Farmers clear and burn a small area of forest to plant and grow crops (Myers, 1991a,b). A myth called the "Hamburger Connection" is based on the belief by some that the forest is mostly cleared to support cattle ranching so that more hamburger beef can be exported to the U.S. The reality is that American ranchers produce a beef surplus, which is exported to other countries.

One of the main issues presented and discussed in class is Global Climate Change as related to excess greenhouse gas (GHG) production. Both cause and solutions are

explored in class by reviewing recent international reports from scientists and organizations. For example, in Holland farmers must practice nutrient management by using diets formulated to reduce nutrient wastes from livestock (i.e., ecological nutrition). One expert, Dr. Judith Capper who is an international livestock sustainability consultant, has widely published on how intensively-managed, large-scale livestock production systems can reduce GHG emissions (White et al., 2015); however, her work is considered controversial by some experts who question her computer models. In crop production, farmers world-wide are adopting GPS-based technology by using satellites to more precisely apply only the necessary amount of chemicals (e.g., fertilizers, herbicides, and pesticides) to minimize the environmental impact of the air, land, and water.

The World Bank strongly supports animal and crop agricultural projects in countries with the aim of protecting the environment. A short video is shown: Remedies: Healing the Earth (produced by Heifer International) which demonstrates alternative practices for small farmers in LDCs. Example include the use of biodigesters from animal manure to produce biogas instead of using firewood to meet household energy needs, planting trees, and zero grazing of livestock, to prevent overgrazing in an effort to protect the planet.

Livestock Grazing and Rangeland Issues

This module begins with the statement that livestock grazing of the world's vast rangeland regions is the most ubiquitous activity of humans on the planet. Students take a history lesson by learning that certain regions that were once pristine and ecologically functional eventually became stark, human-made deserts. In the textbook, Cheeke provides an excellent treatise on how the exploitation of the earth's limited natural resources (in terms of unsustainable crop production or livestock grazing practices) contributed to the process of human-made deserts, not to mention driving many native animal and plant species to extinction. Moreover, in a book entitled, Collapse: How Societies Choose to Fail or Succeed, Diamond (2011) reveals how entire past civilizations (e.g., Sumerians and Mayans) collapsed when natural resources became exhausted and(or) cycles were disrupted due to unsustainable agricultural practices, which offers a vital lesson for the present generation.

More recent factors contributing to further land abuse has included poor government policies and misguided international programs, as well as prolonged droughts and Global Climate Change. References are made to programs such as the Food and Agriculture Organization of the United Nations, U.S. Agency for International Development, and the World Bank that are seriously addressing land abuse problems. Governments too are now playing a more aggressive role through policies involving the protection and restoration of rangeland ecosystems, such as in Australia, Mongolia, the Patagonia, and the Sahel.

An excellent video entitled "Journey to Planet Earth - Seas of Grass" is played in class that includes travel to Mongolia, Patagonia, and South Africa, including the American West. While a sobering historical case is first presented for each region involving abuse, it closes with a description of present sustainable practices that are restoring these regions which offer hope. Students watch a Ted Talk lecture by Allan Savory who is a rangelands ecologist from Zimbabwe. He is an advocate of using proper grazing livestock management practices that can potentially restore abused rangelands into productive, species-diverse, and functional ecosystems. The Food and Agriculture Organization (2013) extolls that healthy pasture ecosystems are an effective carbon sink in mitigating carbon dioxide and methane levels in the atmosphere when maintained by proper livestock grazing management practices. A common reason for justifying the grass-fed beef industry is that it is more sustainable as an "environmentally-friendly" system (Ruechel, 2006) as opposed to the grain-fed beef industry (e.g., feedlots), although this position is a debatable one, requiring further research.

A supplemental PPT presentation, prepared by a colleague (A. Ortega-Santos) who is a range scientist is delivered to students that highlight ranch management practices, tools, and measures that can be used to improve rangelands anywhere in the world. Students are taught how to calculate, for example, an animal unit, stocking rate, carrying capacity, animal grazing days, and forage availability involving a pasture or ranch. Of course, the purpose for grazing management planning is to ensure that rangelands are not abused to protect the ecosystem.

Industrialization, Corporatization, and Globalization of Animal Agriculture

Background is first provided to students on the nature and justification of large-scale, confined animal feeding operations (CAFOs) and especially how these operations are perceived by society. CAFOs (referred to as "factory farms" by critics) have only existed in recent decades. It seems that our own rapid world population growth and the fact that most people now live in cities has virtually required that our food be produced on such a massive scale. To reiterate, in developed countries business profits are largely gauged in terms of economic efficiency as associated with large-scale production. Students learn that both large-scale animal and plant agriculture production systems and markets have become increasingly globalized. For example, food sold at competitive prices at Walmart stores can come from any country where it is produced at the lowest cost. But what is the cost of such large-scale economic efficiency to local farm communities and to society, the environment, and ultimately the health of the planet?

Students are then introduced to Dr. Steven Blank who was an agricultural economist from UC-Davis. His provocative book entitled, The End of Agriculture in the American Portfolio (Blank, 1998) extols that the U.S. no longer needs farmers, based on the supposition that food prices are now determined globally, but costs are determined locally; moreover, many farmers receive subsidy payments from the government through taxation. For example, China is a major producer and exporter of apples which are sold are low prices. This has resulted in the bulldozing of apple orchards in Washington state. Today, a typical American meal involves about 1,500 miles for the food to reach our plates (Pollan, 2006).

In addition, a U.S. history lesson is taught to students on how both our government through policy and university institutions (via research and extension programs) have historically promoted the development and preferentially supported farmers with larger operations. CAFOs have even now become vertically integrated to the extent that one company becomes a single profit center that generally enjoys tremendous success. Decades ago there was less concern about the negative effects of CAFOs on the welfare of the animals, the environment, or the hidden costs to society. Fortunately, in more recent times major positive changes have occurred in the agriculture industry, especially through both federal and state legislation and voluntary changes made by industry, which are discussed in class.

In order to be profitable, for many years CAFOs have been highly dependent on cheap energy and grain. Some experts have predicted that in a serious energy crisis scenario that CAFOs could, quite literally, fold like a house of cards. Furthermore, some experts contend that CAFOs have become literal sitting ducks for acts of terrorism. On this point, the book: Collapse: How Societies Choose to Fail or Succeed by Diamond (2011) is again referenced. It is well known that CAFOs are also a prime target of societal groups such as animal rights groups and environmentalists. Some CAFO corporations have relocated their production operations to the LDCs where there are fewer such concerns or restrictions and where labor costs are considerably lower. Food can be exported to the U.S. at even lower prices and still be quite profitable for the corporation which still maintains its headquarters in the U.S.

In terms of additional global content presented in the classroom, the Swedish government case study is presented. Years ago this advanced society mandated as a high priority that safe food be produced while conserving the environment. The government pays subsidies to small farm families to preserve the integrity of old-fashioned, family farm-oriented agriculture that produces food from heritage varieties of crops and breeds of livestock. In fact, the government issues subsidy payments to families from revenue generated from tourism that is attracted to these traditional farms and related cultural events. However, such a wealthy country can afford to import much of their food without using their land to produce food.

Food Quality and Safety

The theme of this issue is about eating globally versus locally from both a food quality and safety or risk standpoint. This issue involves both animal- and plant-sourced foods. Food quality is a common societal concern with several attributes such as food flavor, freshness, and nutritional value. One public perception is that food quality is sacrificed as a consequence of commercial food production systems (e.g., CAFOs and crops grown in monocultural systems, and GMOs). Students learn that to a certain extent this statement is true. Ultimately, the consumer has a choice about where to buy their food – globally or domestically – from CAFOs or local farms.

Concerning food safety, agencies such as the Food and Drug Administration and the World Health Organization consider this to be a major health issue. With this background, students then learn about specific food-borne pathogenic diseases, such as Asian Bird Flu, Bovine Spongiform Encephalopathy (Mad Cow Disease), E. colitis, Salmonellosis, and Tuberculosis. The potential health risks are also discussed of residues or potentially harmful effects of using, for example, antibiotics in livestock production and commercial chemicals applied to plants (e.g., herbicides and pesticides) that can potentially contaminate animal- and plant-sourced foods. To balance the discussion, students learn that many foods contain natural, even deadly, toxins, such as cassava containing cyanide and grains being contaminated with molds.

Generally, the greatest food safety risk lies in consuming food that is imported from other countries. This is because less is known about how the food was produced or treated during processing and shipping. Next, in the U.S. case, students debate on the food safety risk of food that is mass-produced on large-scale farms versus food that is produced locally and sold at stores and farmers markets. Ironically, in CAFOs, there tend to be more rigid biosecurity measures in place (including in processing plants) than on small family farms simply because large corporations can either afford it or it is required. People have become sickened and even died from eating food from farmers markets. However, widespread outbreaks are more commonly reported when food products have been centrally processed *en masse* and distributed nation-wide, often involving massive food recalls. Food produced organically is also discussed.

Food quality and safety issues are summarized in terms of the realization that there are always risks to eating food, regardless of the source or production system. To reiterate, consumers make the final decision about the food they purchase and consume. Supplemental materials for this issue include the book, Omnivore's Dilemma (Pollan, 2006) and clips from the videos: Good Food which features David Suzuki (Bullfrog Films) and The Future of Food: Sustainability and Security (Films for the Humanities & Sciences).

Bioethics, Animal Welfare, Animal Rights, and Biotechnological Issues

Two major contentious issues presented in this module include: 1) is it moral or ethical to the raise and kill animals for food and 2) is it moral or ethical to use biotechnology (genetic engineering) in the breeding of food animals and plants. Students first learn the basic difference between ethics and morals. The basis of various ethical theories or belief systems is next explored, such as Divine Command, Kantian philosophy, and Utilitarianism, which explain the views of certain radical and traditional societal groups (e.g., animal rights activists, farmers and ranchers, and vegetarians).

Students also learn the differences between animal rights versus animal welfare. The history of the animal rights movement is covered, for example, by citing quotes from classic books: Animal Machines by Harrison (1964) and The Case for Animal Rights by Regan (1983). Articles are also discussed involving recent advances in improving animal welfare systems in the animal industry, as well as reference

to the Animal Welfare Act. Decades ago, Harrison's book provoked the British Government to form the Farm Animal Welfare Advisory Committee, which resulted in establishing the basic Five Freedoms of Animals. Later the European Union would through legislation ban certain animal production practices. These movements precipitated change for U.S. animal and foodservice industries to develop various animal welfare systems used presently by many businesses (e.g., McDonalds and Whole Foods), for professional societies to form committees to issue policy statements, as well as for universities to update their curriculum by including courses that deal with contemporary and environmental issues that address ethical and moral concerns. In addition, websites of the Animal Liberation Front (http://www.animalliberationfront.com/) and PETA (https://peta.org) are visited and short videos are viewed in an attempt for students to understand the position of animal rights activists.

To provide an update on the subject of animal ethics the professor previously read the book entitled, A New Basis for Animal Ethics: Telos and Common Sense by Rollin (2016). Rollin is a pioneer in the field of animal ethics. He has been instrumental in creating a new social ethic that demands that food animal production systems be humane and sensitive to animal's basic needs and expression of natural behaviors or telos. Excerpts from the book are read to students in class, which contributed immensely to student engagement involving discussions and expression of views. Another world-renown pioneer is Temple Grandin who has promoted less stressful animal handling practices and design of facilities with animal comfort and(or) well-being in mind. Short videos are played in class that features both experts.

The issue of the right of humans to bioengineer animals and plants (i.e., scientists "playing God") is next discussed. The position of Rollin (1996) is that genetic engineering is probably the most powerful technology ever devised by humans. However, he identifies a number of potential risks specific to livestock and the health of both humans and the environment. This stance reflects well why the European Union maintains the precautionary principle (i.e., better safe than sorry until more research is done). The European Union still bans GMO foods from either animals or plants, although to date the consensus of U.S. studies demonstrates no health risks.

Presently in the U.S., many if not most commercial crops grown for food have already been genetically manipulated as GMOs. In contrast, the father of the green revolution and Nobel laureate, Norman Borlaug, was a strong proponent on the judicious use of biotechnology as a solution to feed a rapidly growing world population (Borlaug, 2000). Herein, there are no definitive right or wrong answers over such complex contentious issues. Indeed, a salient point of the course is that students need to gain critical knowledge in order to form a position, and ideally one that includes a global perspective.

Livestock Integration into Sustainable Resource Utilization

Cheeke summarizes his book in this last chapter by first introducing the concept of biosphere, which is the theme for this module. In essence, biosphere refers to our planet as being regulated by living, biologically-integrative processes that maintain a state of equilibrium, such as global temperature, cycling of nutrients, and atmospheric gas levels. One of many examples involves the role of rivers in discharging nutrients from land into oceans. In turn, migratory oceanic salmon transfer nutrients back to the land via rivers where they later reproduce, die and decompose (mostly on land because of predators). Later, their offspring return to the oceans where the process is again repeated. Generally, this global homeostatic state has largely been maintained for millions of years although with major, albeit relatively brief, geological shifts eventually regressing to a state of equilibrium. The problem is that humans have dramatically disrupted this natural, self-regulating system through, for example, massive carbon dioxide emissions largely from automobiles using fossil fuels, deforestation and burning of trees, overgrazing by livestock of rangelands, desertification, erosion of soil from croplands, resulting in the present global climate change crisis. Students are then introduced to the pioneer of the "Gaia Hypothesis", Dr. James Lovelock, who coined this term that embodies the biosphere concept. Dr. Lovelock is featured in a short YouTube video (Beautiful Minds) that is played and later discussed.

Cheeke next proposes a "New Agriculture" futuristic model that involves the adoption by farmers and ranchers of more sustainable agricultural systems to produce food involving holistic management of the earth's natural resources, and being integrated with natural cyclic processes that do not harm the environment. A central focus promotes robust ecosystems (i.e., livestock and plant species diversification and integration, crop rotations, composting, and integrated pest management practices) as opposed to present monocultural animal and plant food production systems that generally result in dysfunctional ecosystems.

The New Agriculture model also includes a revamping of university agriculture curricula. This includes an emphasis on relevant required courses to highlight aspects of sustainability, such as range ecology, "ecofarm" enterprise and(or) farmer market development, and heritage breeds of livestock and species and varieties of crops. For example, the author also teaches a course entitled, International Animal Agriculture (Lukefahr, 1999). Students learn about different animal production systems that involve polycultures which are sustainable and implemented in many countries (Preston and Rodriguez, 2009).

In this Contemporary Issues course, students are exposed to popular and even some controversial books and movies, such as the book, Diet for a Small Planet by Frances Moore Lappé (1971). This was the first major book that delved upon the myths that meat production is wasteful from an environmental point of view and that it is a contributor to global food scarcity. Short YouTube video clips are also shown from the movie Food Inc., based on the controversial book, Fast Food Nation (Schlosser, 2002). To provide some balance, students are also introduced to sustainable projects guided by organizations such as Heifer

International and the model, sustainably-managed farms of Will Harris of White Oak Pastures in Bluffton, Georgia and Joel Salatin of Polyface Farms in Swoope, Virginia. This module concludes with the statement that, ideally, farmers and ranchers of the future throughout the world should not only produce food but gain the respect of the public as the original environmentalists by being good stewards of the land.

Discussion

To date, this course has been taught to 398 undergraduate agriculture majors. In some years the course was divided into sections and capped at 25 to 30 students to enhance the quality of class discussions and (or) encourage student engagement. Overall, this course projected contentious issues in agriculture from a U.S. to a global level. This dimension resulted in students attaining more knowledge (as well as appreciation across cultures), and in the process likely deepened student's level of critical thinking in understanding or solving complex issues. Wingenbach et al. (2003) surmised that incorporating global content into courses was effective "to increase students' international knowledge by making stronger connections with 'real world' events" (p 33) as cited by Morgan and King (2013).

Moreover, in addition to classroom discussions where students articulate their position on an issue, the writing of many short essays throughout the semester (with the opportunity for revision) likely enhanced intellectual skills whereby students became better writers as documented by (Orr, 1996). As previously stated, students also had the opportunity to regularly meet with a tutor at the University Writing Center. The professor received a follow-up email message by the tutor which explained the nature of the visit. This visit was recorded, which factored into the student's participation grade. In general and across years, scores on essays improved throughout the semester. These results were used to assess specific student learning outcomes for the course.

In a broader context, Slater (1998; cited in Forsberg et al., 2003) conveyed that the effort of universities to internationalize their curricula is paramount to the success of our nation. Morgan and King (2013) stated that increased global issues awareness can potentially impact career success in the global market place and as global citizens. However, despite this recognized impact, there is little evidence of animal science departments, and even colleges of agriculture, who offer international-themed courses to their students (Forsberg et al., 2003; Swanson, 1999), although there is the need to conduct surveys to determine the current status.

With respect to student learning outcomes, it is not possible to definitively determine the merit or value of adding global content. Such an attempt to conduct a quantitative assessment is problematic. Hypothetically, two class sections would have to be created whereby students in one class serve as the control (little to no global content to establish benchmark parameters) and students in another class that represent the experimental group (additional global content). The problem here is perhaps more of an ethical one because students in the experimental group could be learning more by gaining a deeper understanding of the issues as previously explained. Also, it would not be a blind study; students would find out soon enough that the course sections are being taught differently. Probably the most suitable approach would be for students to complete a survey at the end of the semester (although there would be no benchmark values) to assess their perceived value of added global content using a hedonic scale, which is planned for future classes.

Conclusions

Throughout the semester, students not only learn about contemporary issues in agriculture from a global perspective but also about the impact that has been shaped by internationally-renown experts, world development organizations, major global events, etc. This exposure enhances student's critical thinking and problem-solving skills by being able to later recall knowledge and understanding gained by specific examples, and ultimately apply these skills to their own careers. Another skill that students acquire largely through writing is to balance the advantages and disadvantages, for example, of a contentious agricultural practice (e.g., raising animals in CAFOs and genetic engineering of animals and plants) or an issue (e.g., Do animals have the same rights as humans?) in forming an educated position. Students learn to be critical when reading popular sensational writings or viewing videos. Students also gain an appreciation for the importance of conducting independent research from credible scientific sources to separate fact from fiction. However, for some issues such as: Is it right to raise and kill animals for food consumption, there are no right or wrong answers. Instead, it is a matter of one's own opinion, which should be respected.

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Faculty Professional Development and Instructional Design for an Interdisciplinary Graduate-Level Online Course

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Abstract

This study used qualitative inquiry and evaluation methods to describe faculty professional development while developing and delivering an online, interdisciplinary course. Faculty were charged to create culturally rich Reusable Learning Elements (RLEs) from each of the modules focused on the National Institute of Food and Agriculture (NIFA) priority areas. All faculty (N = 9) who facilitated the development of at least one module were interviewed using an open-ended interview protocol. Some faculty were highly knowledgeable about their content area for the course and some were incorporating new material. Most struggled with the amount of content that could be included and transitioned across the course. Faculty wanted more interaction across the multi-institutional team (three universities were involved). Working across universities was considered a rewarding aspect of the project. Case study development was challenging for some instructors but enhanced the overall course content. Overall, the competence gained in instructional design showed growth from 6.5 to 8.0 in instructional design. For

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professional development in the use of technology, there was no recognizable change. Faculty reflection on their perceived professional development was helpful for career development and important for the implementers of the grant project for course improvement.

Introduction

"We must become able not only to transform our institutions in response to changing situations and requirements, we must invent and develop institutions which are learning systems, that is to say, systems capable of bringing about their own continuing transformation," Donald Schön, 1973.

Faculty professional development has long been a critical component of higher education. The 1950s and 1960s were the age of the scholar with a focus on research skills and productivity (Meyer, 2013). Moving into the 1970s, development moved into the age of the teacher, focusing on improving teaching skills and abilities. The 1980s were the age of the developer, where development departed and faculty-centric programs (teaching and research) began to emerge. The 1990s were the age of the learner with the focus shifting from teaching to learning. Today, we are in the age of the network, which focuses on "collaboration across faculty to encourage interdisciplinarity…and assisting faculty to learn how to best use technology" (Meyer, 2013, p. 2).

As background for this study, nine faculty from three universities developed 14 online modules (weekly lessons) for a graduate-level course titled The Nexus of Global Horticulture and Human Nutrition to Enhance Community Resilience and Food Security (NEXUS), which was funded through a United States Department of Agriculture Higher Education Challenge Grant. An overview of the course modules can be seen in Table 1. The course was hosted through AG*IDEA, the Agricultural Interactive Distance Education Alliance—a consortium of distinguished, accredited universities offering fully online education programs in agriculture and related fields. The course was launched in Spring 2018 with 15 students from a variety of disciplines (agricultural and extension education; agricultural leadership, education, and communications; horticulture; nutrition; and public policy). Case studies were developed by the faculty instructors to assist students in connecting the interdisciplinary content to "real world" examples in global nutrition and health.

One outcome of the project was to determine the professional development of faculty related to their instructional design experience for this course. For this study, the instructional design process included the ability to: (a) integrate technology for online instruction, (b) develop interdisciplinary content across multiple institutions, and (c) develop case studies to enhance student synthesis and content integration.

This study addressed three research areas outlined in the American Association for Agricultural Education (AAAE) National Research Agenda, including (a) what methods, models, and programs are effective in preparing people to solve complex, interdisciplinary problems?, (b) what evaluation methods, models, and practices are effective in determining the impacts of educational programs?, and (c) how can formal and non-formal curriculum in agriculture and natural resources address emerging, complex issues? (Roberts et al., 2016). The secondary component of this work addressed university faculty professional development to improve interdisciplinary instruction in an online format.

Table 1. Course Schedule for The Nexus of Global Horticulture and Human Nutrition to Enhance Community Resilience and Food Security (NEXUS)

Week	Class Topic
Week 1	The Nexus of Horticulture, Human Nutrition, and Agricultural Development (TAMU)
Week 2	Understanding Food Security (TTU)
Week 3	Famine (TTU)
Week 4	Theory of Change (TAMU)
Week 5	Human Health Challenges Related to Nutrition (TTU)
Week 6	Child/Maternal Nutrition (TTU)
Week 7	Measuring Impact (TAMU)
Week 8	Introduction to Horticulture in Developing Countries and the Value Chain Approach (UA)
Week 9	Production Systems and Constraints (UA)
Week 10	Horticulture Market Systems (TTU)
Week 11	Good Agricultural Practices and Food Safety Issues (UA)
Week 12	Beneficial compounds in fruits and vegetables (UA)
Week 13	Post-Harvest, Preventing Food Loss (UA)
Week 14	Preservation and Processing (UA)

Faculty development programs and assessments play a central role in the transformation and sustainability of educational institutions providing high-quality teaching and learning (Fink, 2013). Assessing the degree of faculty professional development is important for four potential audiences: (a) project implementers, (b) prospective faculty participants, (c) institutional administrators, and (d) external funding agencies. This project was funded by an external grant, so evaluating the level of development provides a record of accomplishment for these agencies to reference when deciding whether to continue funding the project. Ultimately, the question of impact relates to whether participation in this project led to changes in teaching that yielded improved student engagement and better student learning (Fink, 2013).

DiBenedetto and colleagues (2016) examined undergraduate student attitudes towards interdisciplinary

education and determined that "undergraduates must be prepared to engage in problem-solving and entrepreneurial thinking" to bridge research and policy decisions (p. 167). Other researchers have reviewed faculty competence in active learning strategies to improve the quality of graduates for the workforce (Blickenstaff et al., 2015; Stedman et al., 2011). Harder and colleagues (2009) determined a need for faculty professional development in how to use active learning strategies to increase student engagement and critical thinking. Developing interdisciplinary content and active learning strategies increases teaching complexity.

Within the agricultural education profession, past studies have focused on faculty perceptions of electronic technologies in teaching (Dooley and Murphy, 2001; Gammill and Newman, 2005; Wingenbach and Ladner, 2002). Now that using technology in teaching has become more common, research has focused more on specific types of media or approaches that provide access to learners—anytime and anywhere—and promote student engagement. For example, some faculty have been using reusable learning elements (RLEs) for the development of flexible online materials that can be used in both formal and informal educational settings. OER Commons (www.oercommons.org) and MERLOT (www.merlot.org) are repositories of short lessons that include a learning objective, a short-sequence of content, and an activity for assessing and applying knowledge from the RLE. In this project, after completing the online course, select faculty and graduate students participated in an international field trip where culturally and contextually rich content was developed to internationalize the curriculum.

In addition to RLEs, faculty members also constructed case studies for the course. Two decades ago Wardlow and Johnson (1999) found that faculty in colleges of agriculture and related fields were comfortable with traditional classroom teaching but lacked skills and interest in developing abilities in the use of "case studies, discovery learning, and peer observation" (p. 47). Lamm et al. (2017) found that case studies were effective in enhancing extension programs. Booney (2015) found case study teaching improves student performance and perception of learning gains, and was highly adaptable for problem-based learning that promotes analytical skills development. Even though there is evidence of the effectiveness of case studies as a teaching strategy, it is not clear if professional development has been examined in agricultural education after the need was expressed in previous research.

Today, teaching excellence in higher education is an important focus. Research by Lang and colleagues (2010) outlined effective evaluation tools in: a) teaching, b) scholarly teaching, and c) teaching and learning. Yet, their research concluded with noting that "evaluation of teaching is not a uniform proposition" but "teaching excellence and student learning are essential qualities of higher education and must continue to be a hallmark of agricultural colleges" (p. 14). Osborne (2011) provided a challenge catalyzing the need to further investigate the extent to which faculty developmental interventions work in improving the teaching and learning process. While Stedman and Adams (2012) continued the conversation and encouraged "better teaching strategy [leads to] better outcome; understanding how to bridge these two ideas will determine how successful faculty are at teaching important transferrable competencies" (p. 14). Furthermore, Wilson et al. (2010) noted that "a teacher who achieves high levels of learning is no doubt a great teacher" (p. 64). Understanding the level and ability of faculty to develop and integrate online instruction while collaborating across content and universities is an important skill for teachers in the 21st century.

In addition to assessing the professional development of faculty members, this study implemented a formative evaluation. The researchers interviewed faculty during the first year of the grant, and this interception of ideas and issues allowed for corrections and actions to be taken before the next iteration of the course. Formative evaluation refers to information collected during the formation of a product to allow revisions to be made (Flagg, 1990). While course corrections recommended from faculty feedback were not incorporated until the second-year implementation, the first year of the project allowed for a pilot year where course revisions could be made. Formative evaluation, discussed by Sadler (1989) from a student perspective, can be easily applied to faculty professional development as it relates to adult learning (Knowles, 1980). For participants to improve, they must have the capacity to monitor their work during production. Thus, feedback (in the form of interviews for this study) functions successfully in formative assessments. Participants are able to discern and appreciate high-quality work and are given the tools needed to modify their own work (Sadler, 1989).

For this project, the intent was to determine the instructional design of faculty in three domains: (a) development of online teaching competence, with the use of renewable learning elements (RLEs), (b) working on a multi-institutional team on an interdisciplinary course, and (c) using case studies as a teaching tool. No previous studies were found to examine all three of these factors.

The theoretical framework for this study was based on the concept of andragogy, the art and science of helping adults learn (Knowles, 1980). The assumptions of adult learning can be summarized as (a) moving from dependency to self-directedness of learning, (b) drawing upon life experiences, (c) relevancy to new roles and responsibilities, (d) just-in-time learning with the ability to apply learning immediately, and (e) motivation to learn being intrinsic or internal rather than external. Adults need to know why they are learning something, with opportunities to transfer knowledge and skills for solving relevant problems. Self-directed learning is "a process in which individuals take the initiative, without the help of others" to develop their own learning experiences (Knowles, 1975). These assumptions are relevant to faculty professional development and the premise of this research study.

Purpose and Objectives

The purpose of this evaluative research study was to determine the attitudes and competencies of faculty across three universities collaborating on an interdisciplinary online course. The goal of this assessment was to determine the professional development opportunities needed for this faculty team. The objectives of this study were to determine instructor's attitudes toward: (a) creating online instructional materials without specific asynchronous training, (b) collaborating across institutions and interdisciplinary content, and (c) developing case studies as a teaching tool after participating in a team-taught course.

Methods

The University of Arkansas (UA), Texas Tech University (TTU), and Texas A&M University (TAMU)

Institutional Review Boards approved the study protocol and all participants were provided written

informed consent prior to participation in the study. This study used qualitative inquiry and evaluation methods to describe faculty professional development while developing and delivering an online, interdisciplinary course. The method is best described as phenomenology because the intent is to understand the "meaning, structure, and essence of the lived experience" for these faculty (Patton, 2002, p. 104). All faculty (*N* = 9) who facilitated the development of at least one module were interviewed using an open-ended interview protocol. In addition to open-ended questions, faculty were asked to self-assess their instructional design abilities before and after involvement in team-teaching. The scale was one (novice) to 10 (expert) for overall instructional design experience and the use of technology for teaching. Two external evaluators conducted the interviews, often with both present for the interviews to triangulate field notes. Interviews were collected in person or via Skype based upon physical proximity to the faculty. Faculty selected a pseudonym to use for confidentiality (see Table 2).

Patton (2002) emphasized that "focus in evaluation research should derive from questions generated at the very beginning of the evaluation process" (p. 435). Three external evaluators worked directly with the Principal Investigators of the federal grant and faculty leaders to develop the evaluation plan. Faculty were charged to create culturally rich RLEs from each of the modules focused on the NIFA priority areas of Global Food Security and Hunger, Community Resilience, and Childhood Obesity. The professional development outcomes for faculty were: (a) gain greater knowledge of global cultural diversity, agriculture, horticulture, and nutrition, (b) develop more positive attitudes about integrating global aspects into teaching, (c) develop more positive attitudes about participating in multi-disciplinary, issues-based teams, and (d) develop increased competency in the instructional design and implementation process. The "fluid and emergent nature of naturalistic inquiry makes the distinction between data gathering and analysis far less absolute" (Patton, 2002, p. 436). The project outcomes served as the primary "themes" as gathered from the interview transcripts.

To ensure trustworthiness, interview transcripts were sent to the faculty with an opportunity for member checking. A peer debriefing memo was developed and mutually agreed upon by the external evaluators. Two of the evaluators also had direct contact with the instructors in the management of the online course to enhance prolonged engagement and persistent observation. The findings include representative quotes to enhance the transferability of the findings to similar contexts (Lincoln and Guba, 1985).

Table 2. Characteristics of Faculty Respondents

Instructor Pseudonym	Years of Experience Teaching	Years of Experience Teaching Online	Growth in Instructional Design (Novice=1, Expert=10) Before - After
Busta	24 Years	A couple of years	3.5 - 6
High Quality	Almost 25 Years	About 4 years	9.0 - 9.0
Isabel	8 years (high school) 20 years Extension 3 years at the University	First time	7.0→8.0
Nancy	Over 20 years	Over 20 years	7.0→9.0
Neena	Almost 20 years	About 10 years	9.0→10.0
Rogue	6 years but light teaching load	3-4 years	5.0→6.0
Tropica	34 years	Over 20 years	8.0→8.0
Poe	2.5-3 years	First time	3.0→8.0
Eric	15 years	1.5 years	7.0→8.0

Results

Faculty were asked about their prior teaching experience, including online teaching, before working on this project. Probing questions included aspects of working on an interdisciplinary team across institutions and the inclusion of case studies in their developed modules on specific global issues. The instructors had a wide range of teaching experience (3-34 years). Based on the original evaluation outcomes for faculty professional development, interview transcripts were sorted to describe each outcome. Table 2 (previous page) shows the distribution of teaching experience, both online and in the classroom, as well as growth in instructional design for all respondents.

Knowledge of Global Cultural Diversity, Agriculture, Horticulture, and Nutrition

Some faculty were highly knowledgeable about their content area for the course and some were incorporating new material. Most struggled with the amount of content that could be included and transitioned across the course. "When it's your discipline, it's hard to say what is important and what isn't important…finding the content that was most important for the students and balancing it with how much was reasonable for a one-week lesson" (Rogue). Busta exclaimed: "I bit off more than I could chew! Developing content took longer than I expected…but it was good to review [the topic]… like a 'greatest hits album' for my topic area." Tropica expressed that her "topic for this course was not in my area of specialization…so I needed to make sure content was appropriate." The most challenging aspect for Poe was that "there was so much information and I must fit as much of this information into one week of work, deciding what's most relevant, and then fitting it into the other modules in the course." Poe added it was:

> a big refresher on food security and getting new and updated information that changes instantly…that could give students something fresh and applicable, like gender and youth issues. While I was searching for materials [for the case study], struggling with not wanting to make lectures…being able to provide my students with resources to continue their active learning in food security.

Nancy also expressed the challenge of:

> trying to share everything I know about the topics in three hours…I already had the content, but it was challenging to make sure it was compatible with what was needed by the groups, and we were committed to a similar look and feel…making sure it met the need and complemented other pieces.

Eric expressed some challenges due to being new to the discipline of agricultural development…but thought that the delivery went smoothly. He did realize that the video was too long in the module, so he had to cut it down. Isabel had a positive experience with content development but was challenged to fit her content with the course objectives. She stated that it was a positive experience that allowed her to review topics and expand them in new directions. She used many of these same topics when she was an Extension educator but had never focused on the underlying theories before. High Quality stated that the biggest challenges were unclear expectations, but that it was rewarding to apply general topics for the course to specific areas of interest. Rogue used similar design tools for other courses she developed in this topic area but added:

> I had difficulty knowing how my module fit in with the rest of the course content…I never saw the learning objectives for the other modules… This course was different because the students had different base knowledge… I wanted to create something that would work for them.

Attitudes about Integrating Global Aspects into Teaching

Instructors had an opportunity to provide advice to someone new to adding global aspects into teaching. Neema indicated that the:

> most important thing is that most people forget that online courses are designed differently, the timing, the posting, the assignments are very different…[You] can't just take a face-to-face course and implement it online with no changes...I work backward to find what questions I can ask and what misconceptions I can bust in the process.

Nancy shared similar advice as Neema:

> I would tell them to ask for examples and guidance on what the team wants it to look like in the end and work backward…Sometimes we are so close to the subject matter that we forget how to break it down. We must give less content, so the student can learn it better. We must level the playing field with an interdisciplinary course… This is a great opportunity to serve students, so they gain an appreciation for new knowledge. Both faculty and students learn from each other and interacting with students at different institutions.

Tropica noticed that there was overlap across modules and recommended that "we should have more discussion amongst ourselves to make sure there was an even flow through the content." There was also a concern that she "may not have been active enough checking on my sections due to other obligations." Eric believed that "training for the technological part is critical, especially video editing related to the content and structure of the course." He goes on to share that he "thinks the project could be improved with a way to be connected to all faculty, like a workshop or overview in person, a website with templates/instructions, and ability to receive email feedback on lesson updates." Poe saw the greatest professional growth given her lack of experience initially in the project. Her advice was to:

> look to those with more experience, get to know your

team, identify a stronger leader if you have questions/ doubt, review and get feedback from your peer group, take advantage of your community and understand that your weaknesses are their strengths to become fully developed.

Isabel added: "Learn the technology. When you don't know it, it is not always worth it to learn it or figure it all out, so hire someone or find someone to help you with it." It is important to look at the whole picture and match your content with course objectives to determine what the students need to learn. She suggested that all faculty involved should follow a specific format with clear guidelines. Busta cautions to not sign up for too much. He desired to know earlier on what other people were doing to improve the flow of the course. "Reach out to people—I didn't know what others had done." High Quality believed that the key to success for creating global content was to "work with everyone and try to make sure that you understand what you are supposed to accomplish." Rogue added that you should "utilize people who have already done it… don't just rely [only] on instructional designers."

Attitudes about Participating in Multi-disciplinary, Issues-based Teams

Often a difficult component of any multi-institutional project is managing faculty across campuses. How do you create a "team" while also being cognizant of faculty time constraints? For this project, faculty wanted more interaction across the multi-institutional team. Eric expressed sentiments like "there was not a lot of interaction between the faculty…due to that, the module order needed to change for flow of content and one assignment was eliminated." Rogue rarely interacted with anyone besides a departmental colleague and the lead team. "It felt very isolated, especially only having one meeting almost a year and a half ago now…We were all struggling individually instead of struggling as a team." Rogue opined that the lead team should keep everyone involved and she would have liked opportunities for video meetings and check-ins to "feel more like part of the team." Isabel was unable to answer this question because she did not directly interact with any colleagues. Busta also stated that he didn't interact with anyone besides a departmental colleague. He had heard of some of the other instructors before but did not know anyone personally. High Quality explained that though the idea of the grant aimed to include this type of interaction, he would have liked to see more opportunities for interaction. "Overall, the experience was rewarding because I learned about online learning as well as new content and [the multi-institutional setting] helped me formalize my thinking process… some issues could have been easily resolved with minor effort from organizers" (High Quality).

Working across universities was also considered a rewarding aspect of the project. Tropica stated: "Watching it come together; we are now creating a new degree program, so I can see where features meshed well… It was nice to work with people working in that area." Poe added: "I created a relationship with other instructors on the project who were more experienced teachers who helped with content and online teaching…daunting at first and they gave me support." Nancy believed that in working in the interdisciplinary setting:

> It was difficult to meet every requirement of what was asked for this course, but the charts and deadlines were very helpful, as well as being able to see the Blackboard interface…Getting faculty together to discuss improvements and sharing expertise benefits the students…I enjoyed working with the instructional design team, as they were prompt and helpful.

Competency in the Instructional Design and Implementation Process

When asked about familiarity with using RLEs, some faculty were still unsure. Neema who had 20 years of teaching experience stated: "This was my first time to develop an RLE…it required a lot of thinking to develop—a higher level of thinking, more time consuming." Poe with less than three years of teaching experience described:

> I have never taught online, most of my experience was as an e-learner…so [I] modeled instruction after my favorite online classes…Faculty can get stuck in a pattern of lecture and taking notes, so I sought out a professor who does a lot of online learning…who provided topics and sources on information. RLEs were a new concept but now I would describe it as a stand-alone lesson in a database for instructors to pull what they need…I wanted to break down massive concepts so it's pliable for students.

Nancy considered herself an expert in the use of technology in teaching. She commented:

> I believe RLEs are valuable and should be encouraged. I don't think we have begun to harness its ability to help students learn. For example, quizzes should not just be about 'gotcha' but should help students learn the content. Feedback from the quiz should tell me why I missed it. We often learn more from what we missed and should look at that for this grant course.

Case study development was challenging for some instructors but enhanced the overall course content. Some instructors were very familiar with implementing case studies (Rogue, Tropica, Neema, Isabel), and some had even published them (High Quality). Neema stated: "I designed case studies that enhance critical thinking, and the student is expected to work at the application level and not just looking up answers from the book." Tropica added: "The case study sample was much more involved than what I've [been] used [to] before" and perhaps a "little bit high-brow" for working with students from broad educational backgrounds. Rogue mentioned: "My case studies for this course were originally developed at the University of Delaware…They laid the groundwork and I modified them for this course." Poe elaborated:

> I had experienced cases as a student, but never created

> one in food security, [with a] scenario and student response and gives an interpretation… that's not really the best style for this content. It should be a problem and research a possible solution (multiple solutions)… Luckily, I found FAO [Food and Agriculture Organization] materials and data where they were identifying problems and generating reports on solutions.

Busta was also new to designing case studies and used his experience in industry as an impetus for his document. Isabel stated: "I had used case studies in Extension…[but] this was my first time using [it] in an academic setting." High Quality expressed that unclear expectations again hindered the development, but he spent a lot of time thinking about what would be helpful for all students. Nancy expanded on the importance of having relevant material for the case study:

> A rewarding component of the case study development included reaching out to a student in DC to work with me on the case study. It really is the impetus of collaboration; working together and finding new collaborators…I had no instruction on how to create one or guidelines or criteria to select one. My partner works for an NGO and is doing project management, so he could provide authentic examples for the case study.

Overall, the competence gained in instructional design was measured using a continuum, from novice to expert (see Table 2). This was meant as a self-evaluation measure to show professional development only. An average score across all faculty showed growth from 6.5 to 8.0 in instructional design. Many faculty members were already experts upon joining the team with competence in instructional design at or above 7 on a 10-point scale. For professional development in the use of technology for teaching, there was no recognizable change. Many faculty had extensive experience teaching online courses prior to joining the project.

Summary

It is evident in the responses of faculty that they were taking the initiative to develop their own learning experiences, drawing upon life experiences, with just-in-time learning and intrinsic motivation (Knowles, 1975). Not only was reflection upon their perceived professional development helpful for their personal career development, it was also important for the implementers of the grant project and future iterations of the NEXUS course. Not all data from interviews focused specifically on personal gains—the project lead team identified key changes that would help future course implementation. Based upon feedback from the instructional team there are recommendations to improve the online course for future delivery, based on the formative evaluation framework (Flagg, 1990; Sadler, 1989). Now that the course content is created, consideration for consistency and effectiveness of delivery is paramount. As with any new team, more interaction throughout the course development would have been helpful. However, busy schedules often made this difficult. Now that the course has been launched, there is an opportunity to introduce the thematic areas to all faculty module instructors and show the connection between the interdisciplinary components. The next steps include engaging faculty instructors to assess other modules in their context area (i.e., sustainable international development, global horticulture, and human health and nutrition). This will allow instructors to access learning objectives and content in other modules in their contextual area and to determine areas of possible improvement in their instruction. Additionally, future efforts should include periodic web conferencing to help with the flow and collaboration across institutions.

Determining the "right" amount of content can be a challenge. Having the first run-through of the course provides the opportunity to determine where to make content revisions. With a broad, interdisciplinary course, it is imperative to help students synthesize and integrate the content across the themes. One suggestion is to use colors or icons to represent a theme and introduce those connections in the introductory module or course overview. Creating opening videos for each module to set the stage for the content and creating linkages across the modules in the course are also recommended for improving the course

It is suggested that three case studies be used, one for each thematic area for the online course, instead of one for each module. For measuring student-learning outcomes, a consistent assignment rubric is recommended to measure critical thinking indicators using case studies. The case studies were challenging for several faculty members, but it seemed to encourage new teaching styles by having to incorporate this material into a new teaching method. Some faculty members indicated that case studies were an effective method for encouraging students to think critically, which connects to Harder and colleagues (2009) recommendation on increasing student engagement. This course was a dynamic setting to explore these types of student engagement strategies, due to its complex, interdisciplinary content and the integration of hybrid teaching methods. The student responses to the case studies were not examined in this study, but further research could compare, through content analysis, faculty and student responses to case studies as an assessment tool for student engagement and learning.

Evaluators did not observe professional development increases in the use of technology in instructional design, but future course implementations may yield development increases in light of the interview discussions and redesigning of course materials for several faculty members after team discussion interactions. After data were collected, the project team met to discuss changes for the course and new technologies may be implemented for the next offering of the course. It may be beneficial to do a longitudinal study of the grant team for the four years it is offered and compare milestones after each year.

Assessing faculty development proved extremely beneficial in many ways, including: (a) providing an outlet for faculty to feel heard about issues with the project, (b) providing an opportunity for increased interaction with the project lead team, (c) allowing issues to be directly addressed

immediately and for the future, and (d) providing a trail for external funding agencies to track the accomplishments of the grant project. It is recommended that these brief interview assessments be added to any multi-university and interdisciplinary educational project, to help bolster the faculty community involved with the project. Providing these check-ins helps assess whether the central question of impact is being properly targeted by the current methods and whether it has led to changes in teaching that yield increased student engagement and learning (Fink, 2013). Last, effective teaching is of high importance in higher education (Lang et al., 2010; Osborne, 2011; Stedman and Adams, 2012; Wilson et al., 2010). Additional effective teaching and evaluation assessments and opportunities should continue.

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Experiential Learning Effectively Supports Workforce-Oriented Agricultural Education in Afghanistan

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Abstract

Numerous Afghan universities have initiated workforce-oriented undergraduate programs. These programs, including the new Department of Food Technology at Herat University (Herat City, Afghanistan), are designed to produce skilled graduates ready to make an immediate impact in the local economy. Here, we report on the efficacy of experiential learning platforms in transferring food technology skills and principles previously identified by Afghan food processors as the most valuable in new employees. The programs used student-led research as a means of mastering food quality assessment methods. Students conducted research, analyzed data, and presented their research and its implications in various forms allowing the negotiation of their new learning. Students improved knowledge of course content and laboratory skills and reported being more motivated to learn by conducting a research project and presenting their results to stakeholders. The programs produced primary data on issues previously identified as critical by Afghan food processors. Thus, additional benefits included: 1) demonstration of capacities of the new academic department to stakeholders; and 2) data robust enough for peer-reviewed publication by Afghan faculty. These programs could serve as models for other Afghan academic programs aiming to transfer applicable skills to their graduates both in agriculture and beyond.

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The Afghanistan economy remains largely agrarian with 40% of its current GDP (outside of international aid) and 50% of GDP growth derived from agriculture (USAID, 2016; World Bank, 2014). Both the central government of the Islamic Republic of Afghanistan and its international

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partners cite growth and improvements in agriculture as keys to rebuilding the country and maintaining security (MoCI, 2013). Several groups, however, have identified knowledge and training gaps in agriculture-focused higher education as critical challenges to realizing Afghanistan's agriculture potential (USAID, 2014).

Over the past 18 years, much effort has gone into rebuilding the Afghan education system with enrollment in higher education increasing from 7,881 in 2001 to 151,649 in 2012. Improving higher education is currently one of Afghanistan's top three economic and social development priorities. Among education priorities, improving agricultural education ranks first (World Bank, 2013).

Afghanistan's higher education does not have the tradition of outreach towards stakeholders directly linked to the academic subject matter (Ebner et al., 2017). This leads to disconnects between what is taught in the university and the skills or knowledge needed by students to find meaningful employment upon graduation. In turn, curricula often do not accurately transfer the relevant or applicable skills students need to succeed in careers aligned with their field of study. Indeed, Afghan students often report dissatisfaction with their level of preparedness for even entry-level positions upon graduation (Baharustani, 2012). Several groups, including the central government of Afghanistan, have pushed to increase the relevancy of higher education in Afghanistan by more closely aligning Afghan higher education curricula with the needs of future employers (World Bank, 2013; MoHE, 2009).

Toward this end, Herat University (Herat City, Afghanistan), in cooperation with USAID and Purdue University recently implemented a workforce-oriented Department of Food Technology, the first food technology-focused academic department in Afghanistan (Peter and Hodgson, 2011). The mission of the new academic department is to deliver an industry-validated curriculum based on quantified skills and knowledge gaps in both Afghan food processing and higher education (Ebner et al., 2017; USAID, 2014).

We previously interviewed 31 Afghan food processors in the Herat area to determine the skills they believed were most needed or desired in new university-educated employees (Ebner et al., 2017). Across commodities, Afghan food processors placed a high value on employees with skills necessary to measure the quality of incoming or outgoing materials or products. In an effort to meet this need, we introduced experiential learning platforms as part of the new food technology curriculum as a means to promote the development of skills currently needed in the Afghan labor market (Ebner et al., 2017). Here we describe our efforts to utilize research projects as platforms to allow Afghan undergraduate students opportunities to learn technical skills needed in the local economy.

Theoretical Framework

Agriculture education has traditionally lent itself well to learning methods that incorporate experiences outside the traditional classroom, whether in the form of internships or tractor repair and maintenance courses. Roberts (2006), however, was among the first to provide a more formal understanding of the theory of experiential learning as it applies to agriculture education. Roberts concluded that experiential learning is defined "as a process or by the context in which it occurs". Roberts defined the process as cyclical with the learner making initial observations, interacting with what is being studied, reflecting on observations, making generalizations from what was learned, and finally testing those generalizations. The cycle is influenced, however, by the context in which the learning takes place, namely the level and duration of learning, the expected outcome, and the setting.

Roberts also identified similarities between experiential learning and other active learning platforms. Similarly, Knobloch (2003) provided a comparison of experiential and authentic learning theories as they apply to agriculture, and like Roberts, discussed the importance of context. Knobloch's analysis described the pillars of experiential learning in agriculture as real-life contexts, learning by doing, project-based learning, and problem-solving. Knobloch then conceptually aligned experiential learning tenets of Dewey, Knapp, Stimson, and Lancelot with those of authentic learning as developed by Newmann and Wehlage (1993): construction of knowledge, disciplined inquiry, and value beyond the classroom.

The use of research projects as experiential learning platforms has a long history. Indeed, the process of student-centered discovery parallels the principles of constructivism at the center of experiential learning (Splan, Shea Porr, and Broyles, 2011). Involvement as an undergraduate in research experience increases students' interest in STEM careers (Russell, Hancock, and McCullough, 2007) and allows application of course-based learning to authentic situations (Stephenson, Peritore, Webber, and Kurzynske, 2013) and can influence professional practices (Kanté, Edwards, and Blackwell, 2013).

Purpose/Objective

Here we describe our efforts utilizing research projects to provide Afghan undergraduate students opportunities to learn food processing technical skills needed in the local economy. We aimed for students to gain course content knowledge through the direct application of that knowledge, with the reflection process increasing the likelihood that the new learning could extend and be applied beyond the classroom. In turn, the research conducted by the students could also be of direct benefit to Herat food processors where primary research on food safety and quality is exceptionally sparse.

Materials and Methods

This study was reviewed and deemed exempt by the Purdue University Institutional Review Board. Eighteen Afghan undergraduate students participated in two experiential learning programs focused on milk quality

and egg quality. Students were all undergraduates in the Faculties of Agriculture or Veterinary Medicine at Herat University (Herat City, Afghanistan). At the time of the research, Herat University was in the process of initiating a Department of Food Technology in its Faculty of Agriculture, the first of its kind in Afghanistan. While the new academic department was being developed, students were drawn from existing departments to participate in a food technology "bridge" program to begin training students in the new field. Students were chosen for the bridge program based on faculty recommendations, stated interest, and English proficiency. All bridge students took part in two, 2-week long intensive (30 hrs per week) food technology courses taking place in the summers of 2015 and 2016, respectively. Additionally, bridge students participated in Applied Food Technology Skills Workshops described here. The Applied Food Technology Skills Workshops utilized an experiential learning platform where students conducted in-depth research projects on specific commodities (dairy and eggs). The overall goal of the research projects was to allow students to master standard food quality assessment techniques and protocols through repetition, while at the same time, providing Afghan food processing industries with robust baseline quality assessment data.

Research Project Design

Two groups of students conducted two separate research projects. Egg quality research (N = 11 students) was guided by the hypothesis that among eggs available to consumers and processors, locally produced (backyard) eggs would be of higher quality compared to Afghan eggs produced under industrial conditions or imported eggs. The laboratory protocols are included here to foster repeatability. Students collected eggs (n = 222) from local retail outlets over a four-week period (July – August 2016). Eggs were transported to the Department of Food Technology laboratory at Herat University for immediate processing. Eggs were weighed and examined for shell defects by visual comparison to accessible standards (AEBC, 2014). Eggshells were tested for the presence of *Salmonella* as previously described (Ebner and Mathew, 2000) with slight modification. Briefly, external eggshells were washed with a sterile sponge and the sponge was incubated at 37°C overnight in 50 mL of tetrathionate broth (Hardy Diagnostics, Santa Maria, CA). Overnight samples were then plated on XLT4 agar (Hardy) overnight at 37°C. Black colonies growing on XLT4 after 24 hours were presumptive *Salmonella* colonies. Internal egg quality was preliminarily measured by candling using USDA guidelines and directions (USDA, 2000). Eggs were then opened and students measured albumen height and eggshell thickness with micrometers. Students used the albumin height and egg weight to assign Haugh values and grades to eggs (Kilpatrick, Brant, and Shrader, 1960). Students then assessed the overall quality of eggs sampled and compared egg quality attributes across the three different types of eggs in the sample set (imported industrial eggs, Afghan industrial eggs, Afghan backyard eggs). Detailed egg quality results are reported elsewhere (Ebner and Ghoryar, 2017)

Similar to the egg quality research project, the milk research project (N = 7 students) was designed to provide consumers and food processors baseline measurements of milk quality in the area. Milk research was guided by the hypothesis that milk from milk shops was of higher quality than milk sold in open markets (bazaars). Milk shops are common throughout Herat City and sell raw fluid milk and various fermented dairy products including yogurt and doogh (cultured milk). Many milk shops have supplier contracts with area dairy farmers.

Students collected raw milk samples from local milk shops (n = 50) and open markets (bazaars; n = 50) throughout Herat City. Milk samples were transported to the Department of Food Technology laboratory and processed immediately or refrigerated at 4°C until processed. Milk quality was based on parameters used throughout the world: total bacteria, coliform bacteria, composition (fat%, protein%, lactose%, ash%), and presence of adulterants. All protocols used here can be found in the Milk Quality and Safety Manual for Afghanistan developed for the new food technology department (Ebner, Ghoryar, Shahkes, and Ghanizadah, 2016b). Detailed milk quality data are reported elsewhere (Ebner, et al., 2016a).

Characterizing and Assessing the Learning Process

Numerous activities were integrated into the research projects to facilitate the four-stage learning cycle associated with experiential learning (Kolb 1984). The process of students' compiling, analyzing, and interpreting their research results was designed to facilitate student reflection on what was learned and the importance of what was learned. With assistance from advising faculty, the student groups were charged with presenting their results to the Department of Food Technology Industry Advisory Board. The board consisted of 12 food processing leaders from the greater Herat area and represented private businesses, extension educators, and government officials. The presentation assignments were designed to facilitate the students' reflection on: 1) what was learned; and 2) the implications of their results and how the results could be applied in the future. Students presented their results in two forms: research posters and oral presentations.

Participating students were also required to take standard examinations at the end of the projects to provide an assessment of course content learning. These exams were largely problem-solving based. As an example, milk students were given analysis results of different milk samples (TS, SNF, fat%, protein%, lactose%, total and coliform bacteria concentrations, results of any adulteration tests) and required to identify any defects or deficiencies in the milk and how those defects could impact shelf-life, safety, and value-added processes such as yogurt or cheese production.

Students also completed self-assessments aimed at gaining their perceptions as to the efficacy of using the experiential learning platform in an Afghan context. The

assessments were created specifically for this project and all questions were reviewed by native speakers for clarity. The assessments were completed by the students in written form upon completion of all activities (research, analysis, presentation, etc.) in under 30 minutes and contained a mix of quantitative questions (e.g., "Compared to your normal classes, how motivated were you to learn about [commodity] quality by doing an actual research project? (1 = much less motivate; 10 = much more motivated) and qualitative questions (e.g., "What do you think are the biggest challenges to improving [commodity] quality in Afghanistan?"). All qualitative questions were open-ended.

Results and Discussion

The student research projects focused on milk and eggs; however, the concepts and many of the specific protocols are transferrable to measuring quality in other commodities. Namely, students were exposed to experimental design and what is needed (e.g., development of hypothesis, determining adequate sample sizes, etc.) to sufficiently answer research questions as noted by others (Russell et al., 2007). Among the various hard skills, the microbiological protocols and techniques in particular (bacteria identification and enumeration) apply to all commodities and the repetition involved in sample analysis allowed the students to gain a true proficiency in each of the laboratory techniques.

At the onset, the courses appeared effective at transferring course content without relying on lecture or teacher-centered content delivery. Students reported substantial improvement in their knowledge of egg and dairy quality assessment through participation in the program (Table 1). Student self-assessments of learning were corroborated by more standardized learning measurements, namely mean scores on problem-solving based exams taken by the students before the course (egg quality pre-test mean: 19.8%) and after its completion (egg quality post-test mean: 84.5%).

Splan et al. (2011) describes how learning through undergraduate research is enhanced through students' social negotiation of newly learned concepts or results. In our program students were charged with presenting their research and its implications to the Department of Food Technology Industry Advisory Board as a means for students to interact with the environment most impacted by their learning. The Industry Advisory Board is a group of 12 food processing leaders from Herat Province and the aim of the board is to assist the department in developing and delivering a food technology curriculum relevant to modern Afghan food processing. Importantly, the board members consist of individuals with a great deal of expertise and experience who may also be future employers. For each research group (milk quality and egg quality), students were divided into two groups and charged with developing research posters (Fig. 1; Fig. 2) or delivering oral presentations.

Based on both informal observations of student reactions and survey results, understanding they would be presenting to business owners with large stakes or interests in the research results compelled students to thoroughly reflect on and understand what they did and the implications of their results, a key tenet of experiential learning (Kolb, 1984). Indeed, students reported that participating in the research project and presenting their results provided much more motivation to learn compared to their normal (lecture-based) classes (Table 2). Importantly, students strongly agreed that the skills they learned were directly applicable to their future careers (Table 2), indicating that learning had value beyond the classroom (Newmann and Wehlage, 1993; Knobloch 2003). Additionally, students were able to conceptualize how that learning could be applied in future situations (Roberts 2006) and reported high levels of confidence in their ability to do so (Table 2). In open-ended questions, students were able to draw from their research to identify what they believed were the biggest challenges in Afghan dairy production, with most students identifying safety in some manner (e.g., "adulteration", "hygiene", "sanitation", "lack of proper cleaning", etc.).

Students also reported being highly motivated to pursue careers in food quality after completing research projects, which mirrors results by Russell et al. (2007), who found that participating in research increased undergraduates' interest in allied careers. Together, these results indicate high levels of self-efficacy as well as confidence and motivation to apply learning in future careers or positions. Unemployment rates in Afghanistan, however, currently hover around 25% (World Bank 2018), with some estimates closer to 40% (Shirani, 2018). Female unemployment is generally two to three times that of males (CSO, 2017). This fact was likely reflected in students' answers to open-ended questions regarding perceived challenges to pursuing a career in food processing where students regularly reported limited job availability.

The success of experiential learning platforms is

Table 1. Afghan Student Self-Assessment of Learning Following Completion of Food Technology Experiential Learning Programs Focused on Egg or Milk Quality

		Eggs[a]		Milk[b]
	Mean	Std. Dev.	Mean	Std. Dev.
Q: Through this research and training, has your knowledge of [commodity] quality improved? (1 = not improved at all: 10 = greatly improved)	9.5	0.5	9.0	1.2
Q: Please compare your knowledge of [commodity] quality before and after this experience. (1 = little to no knowledge; 10 = highly knowledgeable)				
Knowledge before	3.5	1.1	3.1	1.3
Knowledge after	9.4	0.8	7.9	1.6

Note: a N = 11 students; b N = 7 students.

Figure 1. Research poster on egg quality developed by Afghan undergraduate students and presented to the Department of Food Technology Industry Advisory Board.

Quality of Eggs Available to Consumers in Herat City Markets

Herat University, Faculty of Agriculture, Department of Food Technology

Introduction

- Afghanistan imports over 350 million eggs annually[1].
- India alone, imports over 23,000 t of egg products to Afghanistan[2].
- Afghan consumers have many choices of different types of eggs in the market.
- Here we examined the quality of three types of eggs: Iranian industrially produced, Afghan industrially produced, and Afghan locally produced.

Fig. 1. Candling of egg highlighting the air cell and shell cracks.

Procedures

We collected 222 eggs from local retail markets in Herat City and measured quality based on:

- External Defects
- Weight
- Albumin Height
- Haugh Measurement
- Air Cell
- Internal Defects
- Yolk Characteristics
- Shell Thickness

All eggs were also tested for the presence of *Salmonella*.

Fig. 2. Plating egg samples on XLT4 agar to test for presence of Salmonella.

Results

Table 1. Weight, Albumin Height, and Haugh score of Iranian Industrial, Afghan Industrial, and Afghan Local Eggs Available in Herat City, Afghanistan.

Source	Weight, g (std. dev.)	Albumin, mm (std. dev.)	Haugh Score (std. dev.)
Iranian Industrial	48.9 [a] (3.3)	3.6 [a] (2.1)	58.2 [a] (9.9)
Afghan Industrial	55.2 [b] (7.3)	4.8 [b] (0.9)	68.7 [b] (8.3)
Afghan Local	47.4 [a] (7.5)	4.9 [b] (1.8)	71.3 [b] (13.1)

Numbers with different superscripts are significantly different at P < 0.05

Table 2. Internal Quality Characteristics of Iranian Industrial, Afghan Industrial, and Afghan Local Eggs Available in Herat City, Afghanistan.

	Yolk Color		Yolk Score			Meat/Blood
Source	Yellow (%)	Orange (%)	1	2	3	Spots %
Iranian Industrial	100.0 [b]	0.0 [a]	37.8 [b]	44.6 [b]	17.6 [a]	0.0 [a]
Afghan Industrial	84.4 [a]	15.6 [b]	18.8 [a]	62.4 [c]	18.8 [a]	1.4 [a]
Afghan Local	87.2 [a]	12.8 [b]	11.5 [b]	16.7 [a]	71.8 [b]	5.1 [a]

Yolk score: 1 = soft, flat; 2 = medium; 3 = compact, tall; numbers with different superscripts are significantly different at P < 0.05.

Table 3. Air Cell and Shell Characteristics of Iranian Industrial, Afghan Industrial, and Afghan Local Eggs Available in Herat City, Afghanistan.

Source	Air Cell Size	Cracked Shells (%)	Shell Thickness (mm)
Iranian Industrial	1.8 [a]	4.0 [a]	0.38 [a]
Afghan Industrial	1.8 [a]	10.3 [a]	0.37 [a]
Afghan Local	1.9 [a]	12.1 [a]	0.36 [a]

Air Cell Size: 1 = small; 2 = medium; 3 = large; numbers with different superscripts are significantly different at P < 0.05.

Results (cont.)

- Haugh scores of Afghan locally and industrially produced eggs were significantly higher than Iranian eggs (P < 0.05).
- Yolk characteristics of Afghan locally produced were significantly better than all other eggs tested (P < 0.05).
- There was a tendency for Afghan locally eggs to have more cracks compared to other eggs (P = .10).
- Cost of eggs per unit (g):
  - Iranian Industrially Produced: 0.11AF/g
  - Afghan Industrially Produced: 0.12AF/g
  - Afghan Locally Produced: 0.20AF/g

Fig. 3. Measuring albumin height to calculate Haugh Scores.

Conclusions

- All afghan eggs were of higher quality compared to imported eggs.
- Afghan locally produced eggs, however, had the most quality attributes.
- Considering cost, the quality attributes of Afghan locally produced eggs represent 0.1AF/g egg.
- It is up to the Afghan consumer to determine their willingness to pay for these quality attributes.

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[1]Ministry of Agriculture, Irrigation, and Livestock of the Islamic Republic of Afghanistan. 2009. HLP 4th Newsletter: Spedial Issue on the Livestock Production Program.
[2]Windhorst HW, Grabkowsky B, Wilke A. 2013. Atlas of the Global Egg Industry. International Egg Commission.

Figure 2. Research poster on milk quality developed by Afghan undergraduate students and presented to the Department of Food Technology Industry Advisory Board.

Quality and Safety Assessment of Raw Bovine Milk in Herat Province, Afghanistan

Herat University, Faculty of Agriculture, Department of Food Technology

PURDUE AGRICULTURE

INTRODUCTION

- Per capita dairy consumption in Afghanistan is estimated at 66 K/y (whole milk equivalent).
- There are growing dairy segments in several parts of Afghanistan, including Herat Province.
- One growing segment is small milk shops, which serve as an important link in supplying dairy products to customers in the local economy.
- Milk shops shops sell fluid milk and often produce value-added dairy products on site including yogurt, cheese, and other fermented dairy products.
- The quality of these value-added dairy products is dependent on the quality of raw milk.

Students prepare to process collected milk samples.

OBJECTIVE

- Assess the quality of raw bovine milk available to Herat consumers through open markets and milk shops using a universal set of milk quality parameters:
  - Total bacteria
  - Total coliforms
  - Composition (fat%, protein%, lactose%)
  - Presence of adulterants

Dr Ghoryar instructs students on the use of milk composition analysis equipment.

METHODS

- **Samples:** 100 fresh, raw milk samples were collected from open markets and milk shops throughout Herat City.
- **Microbiology:** Total bacteria were quantified using an aerobic plate count (APC) method. Total coliforms were quantified using a violet red bile agar (VRBA) method.
- **Composition:** Fat, protein, lactose, ash, and water percentages were estimated by ultrasound (Lactoscan Ultrasonic Milk Analyzer). Water percentages were confirmed by lactometer.
- **Adulterants:** Antibiotic residues (tetracycline, penicillin, sulfanamides) were measured using Lateral Flow Antibiotic Strips (Charm). Added starch was measured using the iodine method.

RESULTS

Table 1

Age and price of milk samples used in this study.

	Age (% Samples)				Price*
Source	< 6 hr	12 – 24 hr	> 24	Mixed	AF
Overall (n = 100)	53.0	44.0	2.0	1.0	28.7
Bazar (n = 55)	52.7	41.8	3.6	1.8	26.2[a]
Milk Shop (n = 45)	53.3	46.7	0.0	0.0	31.1[b]

*Numbers with different superscripts are significantly different at P < 0.05. Comparisons are between sampling groups (bazars vs. milk shops) and within column. * = at time of collection.*

Table 2

Composition of milk samples collected from bazars and milk shops in Herat City, Afghanistan

Source	Fat (%)	SNF (%)	Protein (%)	Lactose (%)	Salts (%)
Overall (n = 100)	3.25	8.45	3.33	4.76	0.57
Bazars (n = 55)	3.0[a]	8.10[a]	3.29	4.70	0.56
Milk Shops (n = 45)	3.5[b]	8.80[b]	3.38	4.82	0.58

Numbers with different superscripts are significantly different at P < 0.05. comparisons are between sampling groups (bazars vs. milk shops) and within columns.

Table 3

Percentage of milk samples with irregularities (fat or water) or adulterants (starch or antibiotic residues).

				Antibiotic Residues		
Source	Fat	Water	Starch	Beta-lactams	Tetra-cyclines	Sulfa-nomides
Bazaar	34.5[a]	32.7[a]	25.5[a]	4.0[a]	2.0	0.0
Milk Shop	11.1[b]	15.6[b]	2.2[b]	19.0[b]	4.8	0.0

Numbers with different superscripts are significantly different at P < 0.05. Comparisons are within column.

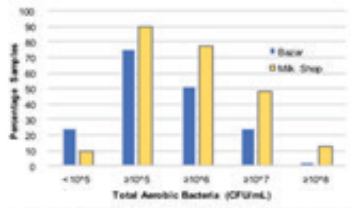

Figure 1. Total aerobic bacteria concentrations in milks samples collected from bazars and milk shops throughout Herat City, Afghanistan. There were no statistical differences between the two sampling groups.

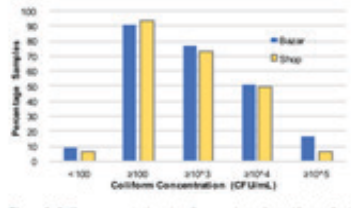

Figure 2. Coliform concentrations in milks samples collected from milk shops and bazars throughout Herat City. There were no significant differences between the sampling groups.

CONCLUSIONS

- Milk from milk shops was more expensive than milk from bazars, but was of higher quality with fewer irregularities and adulterations.
- Most milk samples from both sources, however, had bacterial counts that were above international standards.
- Milk shop owners should work with their suppliers to ensure that milk collection and storage is done using necessary hygiene and sanitation practices.

This research was supported in part by the USAID University Support and Workforce Development Program (USAID).

Table 2. Impact of Food Technology Experiential Learning Programs Focused on Egg Or Milk Quality on Afghan Undergraduate Students' Motivation to Learn Course Content

	Eggs[a]		Milk[b]	
	Mean	Std. Dev.	Mean	Std. Dev.
Q: Compared to your normal classes, how motivated were you to learn about [commodity] quality by doing an actual research project? (1 = much less motivate; 10 = much more motivated)	9.5	0.7	8.4	1.0
Q: Did doing an actual research project (conducting the research, making posters or presentations) help you to learn about [commodity] quality? (1 = did not help at all; 10 = helped greatly)	9.6	0.7	7.9	0.8
Q: Are the skills your learned during the research and training relevant to Afghan [commodity] processing? (1 = not relevant at all; 10 = highly relevant)	8.8	1.3	8.9	1.1
Q: How likely are you to use the research skills you learned in your future career? (1 = not likely at all; 10 = highly likely)	9.4	1.1	9.4	0.8
Q: If a shop owner brought you [commodity], how confident are you that could examine it and determine quality? (1 = not confident at all; 10 = highly confident)	9.7	0.6	7.7	1.0
Q: Has your confidence to determining [commodity] quality improved by participating in this research and training? (1 = not improved at all; 10 = greatly improved)	9.6	0.7	8.0	1.0
Q: After this experience, would you consider a career in the [commodity] industry? (1 = would not consider; 10 = highly consider)	n/a[a]	n/a[a]	9.0	0.8

Note: a N = 11 students; b N = 7 students; c question not asked of this group.

correlated on many levels to the engagement characteristics of the instructor (Stebner, King, and Baker, 2016) and faculty are motivated (and deterred) to engage in experiential learning by numerous factors (Abes, Jackson, and Jones, 2002). Holtzman and Chadwick (2015) described how experiential learning can be much more beneficial to faculty when it can "simultaneously advance students' research skills and faculty research agendas". The projects described here incentivized faculty engagement in that the authentic nature of research produced data robust enough for peer-review publication of results. To date, two publications in peer-reviewed research journals have come from the results (Ebner and Ghoryar, 2017; Ebner et al., 2016a). Our previous research showed that Afghan food processors do not currently look to Afghan universities for technical assistance or future employees (Ebner et al., 2017). Thus, the research also offered faculty the opportunity to build value in their new department by directly engaging with stakeholders and providing technical assistance to food processing challenges the stakeholders themselves identified (i.e., quality of incoming raw materials and outgoing products).

Summary

As Afghanistan continues to build and modernize its higher education system, integrating experiential learning into curricula may prove beneficial in providing authentic learning environments where learning extends and is applicable beyond the classroom. In doing so, Afghan higher education can become more engaged and relevant to employers and other stakeholders. In addition to transferring applicable skills to participants, using research projects as the experiential learning foundational activity can provide additional incentives for faculty, including the opportunity to publish research and demonstrate capacity to industry stakeholders.

The milk project in its entirety is especially transferrable to similar programs in and outside of Afghanistan. Milk quality is measured throughout the world using largely the same parameters: i) total bacteria concentrations; ii) coliform bacteria concentrations; iii) composition; iv) somatic cell counts; and v) presence of inhibitors. While the exact methods to measure these parameters may differ from country to country depending on resources and needs, students experienced in the principles and practice of these measurements have skills as applicable to dairy production in Europe or the U.S. as well as Afghanistan. We have used a similar model with U.S. and Romanian students with similar positive results (Sajdera and Ebner, 2017). The experiential learning theme in both courses, however, is directly relevant to numerous other workforce-oriented academic departments currently under development in agriculture and non-agriculture faculties throughout Afghanistan higher education. It will be of interest to conduct follow-up assessments with participants to determine whether participation in the program influenced their current career objectives or activities, similar to assessments provided by Kanté et al. (2013) of experiential learning based extension trainings in Mali and its impact on professional practices. Finally, it will be critical for the faculty in the new academic department to leverage both the research results and the skills developed in food technology students to gain support from the private sector for the new department as public

sector support for Afghan higher education remains very low.

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Assessing Learning Outcomes of a Two-Week Agricultural Study Abroad Experience To China

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Abstract

College students from the Upper Great Plains Region of the United States often come from small towns (pop. <2000), and many have very limited world experience. Experiential exposure to global perspectives is critical to prepare undergraduates for a better understanding of the world and their future. An International Travel Abroad China Experience (3 credits) was initiated in 2012 through the South Dakota State University College of Agriculture and Biological Sciences with the objectives of exposing students to cultural norms and agricultural production practices of China. In class, students engaged in cultural and agricultural studies and interacted with strategic local and global partners to enrich their learning in-country. The semester-long class concluded with a two-week tour of China to provide travel experience far outside their everyday norm. Pre- and post-trip surveys were used to assess what students gained from the experience and how they perceived the experience prepared them for a life-long career. Here we summarize 2013 to 2016 survey results from 96 students enrolled in the class. Students reported gaining a comparative perspective of agricultural practices as well as a greater understanding of global agricultural markets, career opportunities, and open-mindedness about international travel in relation to their future careers.

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Introduction

Cultural exchange programs lasting a few weeks to several months have been in place for a long time. Educational tourism (one to two week trips) has become common across many fields of study (Falk et al., 2012), especially since the early 2000's (Bunch et al., 2018). These international educational tourism programs are meant to increase global competence of graduates (Kenway and Fahey, 2014; Rizvi, 2014). The benefits of a short in-country experience include a lower price point for students, the inclusion of faculty mentors from the lead institution, and logistical access since they are more time effective than the traditional semester or year-long programs (Zamastil-Vondrova, 2005). Some of the outcomes, such as cultural awareness, intercultural sensitivity, and other cultural gains were found to be greater for students participating in more traditional long-term programs (Dwyer, 2004). However, others have reported that short-term programs do influence students' intellectual and personal lives (Chieffo and Griffiths, 2004), with gains in cultural understanding and communication, and awareness of global dependence (Bunch et al., 2018). Indeed, exposure to international activities expands knowledge and world-view, but immersion has been shown to spur career internationalization (Felker and Gianecchini, 2015). Out-of-classroom experiences have been reported to be the most impactful portion of study abroad (Stone and Petrick, 2013). In addition, using the experiential model of experience combined with reflection and synthesis has been shown to increase the impacts of the experience (Kolb, 1984).

South Dakota State University (SDSU) is a Land Grant university with a strong production-agriculture focus. The majority of the students are from small rural communities in South Dakota, Minnesota, Iowa, and Nebraska, and have had limited international exposure (61% of students surveyed had no international experience; see results). Specifically, South Dakota (SD) has fewer than 1 million people spread throughout its 200,000 sq km area. Most SD communities are small (86% less than <2,000 people) (Cubit, 2019). The average farm size in SD is 566.6 hectares (USDA NASS, 2018). These demographics differ substantially from China which has more than 9,000,000 sq km area, where there are 19 megacities of over 30 M people (Lower et al., 2016), and farm sizes are < 1.0 hectare. This travel experience is especially important for Midwestern students, as, until the trade embargo of 2018, approximately one out of every three soybean rows harvested in the Midwestern U.S. was exported to China. In fact, China imports just under two-thirds of the total U.S. soybeans produced (USDA, 2018) and is the second-largest consumer of U.S. exports at $19.6 B (USDA FAS, 2017). Because of the high level of trade with China, agricultural students are likely to interact with Chinese companies. Thus, it is essential that SDSU students obtain a deeper understanding of the world beyond the Midwest, especially of our international partners, if they are going to be successful in their careers.

Methods

Course Background

Understanding Chinese culture and agricultural production and processing systems will help students prepare for their future careers, give them insight into future career opportunities, and prepare them for lifelong travel experiences. To achieve that goal, the SDSU "China Ag" class was developed to expose student participants to a new culture, make them more globally aware, boost self-confidence, and have fun in the process. The first part of the class was a semester-long course that met three hours per week to expose students to China through different delivery mechanisms including personal discovery and invited speakers with significant experience working in China. The second part of the class was a two-week-long trip to China shortly following the end of the spring semester. The faculty mentors worked with a travel agent to develop a two-week in-country curriculum that included a wide variety of cultural, tourist, and agricultural visits. Chinese in-country tour guides met the class in China and guided the group through each of four major cities. While many activities were planned, students were allowed free-time during the evening to allow for self-exploration, away from faculty and guides.

Participants of the China Ag experience enrolled in a three-credit dual listed upper division/ graduate course that convened weekly during the spring semester and culminated with two weeks of faculty-led study travel in China. Collectively, 96 students participated in this course between 2013 and 2016. The objectives of the China Ag class were to 1) enhance student familiarity with global agriculture practices, especially pertaining to relationships between China and the United States; 2) provide a comparison of culture and lifestyles in China and the United States; and 3) provide an opportunity for students to experience international travel, focused equally on culture and agriculture. The weekly classes were designed to prepare students for a heightened in-country experience.

Strategic local and global partners were engaged in the learning process. Specifically, partners from academia, industry, as well as, community members who had in-country familiarity, were leveraged to convey personal experiences related to culture, agriculture, and career opportunities. Chinese professors and graduate students from the SDSU community were invited to share their perspectives on growing up in China and studying or working state-side. A veterinarian from Pipestone Systems, an internationally known swine veterinary services and management company that has worked in China for almost a decade, led a discussion each year on how intimately involved China/ U.S. pork production has become. An executive from 3M, a multinational conglomerate corporation with a subsidiary in China, shared insights into establishing satellite branches in China, adapting personally to a long-term work assignment in China, and how choosing to work abroad can provide opportunities for accelerated career advancement.

In addition to speakers, a variety of teaching tools were utilized to engage students as active partners in their learning process. Students read current event articles, and two books [Mr. China (Clissold, 2005) and The Ugly

American (Lederer and Burdick, 1958)] with the goal to expand participant knowledge about Chinese culture as well as being a gracious guest in a host country. Students and instructors had an agreement that as long as everyone contributed to discussions on class readings they wouldn't be quizzed on the material. A key topic [e.g., Chinese history (past and current); culture; agricultural practices; finance; climate; and religion] was assigned to each student who then prepared a short paper and lecture on the topic to share with the class, essentially developing each student as our group source on one aspect of China. Students honed their skills using chopsticks while enjoying peanuts and M&M's, and eventually authentic Chinese food prepared by a Chinese professor from the campus community. Every year beginning in 2014, graduates of the China Ag experience were invited to attend one of the class sessions so that they could share their experiences and advice with the current class.

In-Country Travel

Students traveled to Hong Kong, Shenzhen, Guangzhou, Xi'an, and Beijing by plane, train, and bus. The trip to China included well known cultural sites (e.g., Great Wall, terracotta warriors of Xian, Forbidden City), as well as the U.S. embassy, manufacturing plants (e.g., John Deere, China) dairies, Pioneer DuPont, food processing plants, wet markets, a traditional medicine hospital, swine confinement operations, feedlots, ports, family homes, cropping lands, and temples. Students met with U.S. agricultural leaders working in China to promote U.S. commodities including members of the U.S. Soybean Export Council, the U.S. Meat Export Federation, and the U.S. Grains Council. The experience was designed to immerse students equally in Chinese culture and agriculture.

Once in-country, a pair of students was assigned to be the class managers for the day and another pair was assigned to be the official class bloggers. Each evening, the blog was updated with written highlights and a few pictures to keep family and friends engaged in the experience as well. Students maintained a daily personal journal to reflect on events of the trip (Kolb, 1984; Stone and Petrick, 2013). We were able to build on an existing relationship with the Dean of the College of Animal Science at China Agricultural University to plan a day where students from both universities gathered on the China Agricultural University campus to learn from one another. Small teams of 4-5 students offered prepared presentations about their hometowns, majors, and hobbies to students at China Agricultural University. Chinese students also gave short presentations on their studies. The day concluded with a banquet and dance. Upon return to the U.S., students collaborated with a local newspaper to prepare a story about what they gained from their experience. Collectively these strategic activities transformed the student experience from theory- or observer-based to an experiential participation founded on personal insights and interactions.

Student Surveys

To determine changes in awareness, confidence, and understanding of Chinese cultural and agricultural practices as well as international travel, students were surveyed using a pre-and post-travel survey that included participant background, perception, and open-ended style questions. Surveys were administered in class prior to departure for China (pre), and in the airport just before the return flight (post). Questions related to awareness, confidence, and understanding were asked using a five-point Likert scaled response in both the pre- and post-travel surveys. Students' likelihood of returning to China or recommending the experience to friends were gauged with simple yes or no questions. Open-ended participant background questions were designed to gauge the level of prior experience that students had with international travel and with agriculture. The surveys were deemed exempt under federal regulation 45 CFR 46.101 (b) and approved by the SDSU Institutional Review Board (IRB-1304021-EXM).

Statistical Analysis

This study abroad experience was designed to increase knowledge of Chinese agricultural practices and systems, appreciation for Chinese culture, and comfort level with international travel. The China study abroad experience was nearly identical and student demographic data (major, year of study) was similar across years. Therefore, our assumption was that year the student enrolled in the class did not affect our results and data across years was pooled. A paired Wilcoxon rank-sum test was performed using R software to determine differences in perception- and comprehension-based questions (scored on a scale of 1-5) pre- and post-activity for each cohort. A Chi-squared test was performed using R to determine changes in the frequency of affirmative responses for questions related to students' likelihood to go back to China or to recommend the experience to a friend. Differences within class for the Wilcoxon and Chi-Squared tests were considered significant with a P-value of less than or equal to 0.05. Qualitative responses to open-ended questions were reviewed and grouped based on similar topics or focus. The frequency of each topic and representative sample quotes are reported for select questions.

Results and Discussion

Ninety-four undergraduate and two graduate students participated in the China Ag course at SDSU between 2013 and 2016. Forty-eight percent of the students identified as male and 52% as female. International travel was new to most of the students; 61% had never traveled abroad, 29% had traveled out of the country once or twice, and 10% had traveled out of the country three or more times. Most students had commercial (56%) or hobby/small farm experience (31%). However, several were relatively new to agriculture having only experienced the industry through class or internships (12%) or not at all (1%). The diversity of experience level with international travel and with agriculture allowed for students to support one another developing in these capacities.

Student beliefs and behaviors were modified as a result of the study abroad experience (Table 1). Prior to departure, students agreed that Chinese and U.S. markets influenced

Table 1. Student responses to statements comparing US and Chinese agricultural practices and interest in lifelong learning about international issues pre- and post-travel to China

		Likert scale responses[a,b]						
Statements	**Time**	**1**	**2**	**3**	**4**	**5**	**Mean± SD**	**P-Value**
Chinese markets influence U.S. markets	Pre	3.1	1.0	10.4	35.4	50.0	4.28 ± 0.9	
	Post	2.1	1.0	5.2	20.8	70.8	4.57 ± 0.8	0.008
U.S. markets influence Chinese markets	Pre	2.1	4.2	13.5	40.6	39.6	4.11 ± 0.9	
	Post	2.1	1.0	7.3	36.5	53.1	4.38 ± 0.8	0.01
Chinese food safety standards are the same as the U.S.	Pre	38.5	46.9	9.4	4.2	1.0	1.82 ± 0.8	
	Post	58.3	36.5	2.1	0.0	3.1	1.53 ± 0.8	0.002
Animal welfare standards in China are the same as the U.S.	Pre	21.9	61.5	14.6	1.0	1.0	1.98 ± 0.7	
	Post	34.4	45.8	14.6	4.2	1.0	1.92 ± 0.9	0.50
I follow news related to international agriculture	Pre	8.3	34.4	31.3	19.8	6.3	2.81 ± 1.0	
	Post	6.3	20.0	30.5	34.7	8.4	3.19 ± 1.1	0.001
I am likely to read international articles/view international news	Pre	2.1	11.6	33.7	39.0	13.7	3.51 ± 0.9	
	Post	0.0	2.1	20.2	31.9	45.7	4.21 ± 0.8	0.001
Experience will impact my lifelong career	Pre	4.2	3.1	12.5	31.3	49.0	4.18 ± 1.0	
	Post	2.1	1.0	4.2	29.2	63.5	4.51 ± 0.8	0.005

[a]1=Strongly Disagree, 2=Disagree, 3=Indifferent, 4=Agree, 5=Strongly Agree
[b]Data are reported as the % of students (n=96) responding within each category

each other, and this belief was enhanced after travel in China (P < 0.01). However, one of the biggest changes was the student's belief that Chinese and U.S. food safety standards are equivalent (P = 0.002). This view was changed after students visited wet markets in Beijing and Xi'an, where fresh meat and fish were sold and after visiting very large fresh fruit and vegetable markets. Student impressions after travel were that there was no sense of quality control. The students observed no refrigeration of fresh cuts of meat, and offal remained on the pavement, close to where the fresh cuts of meat were hanging, both of which attracted flies. Out of the 96 students, 35 directly commented on either the lack of biosecurity, "things are not thrown in the garbage, but just placed on the floor", or the lack of sanitation in the wet markets. This experience modified student thoughts about U.S. regulations for food safety was evident through their comments, "[wet markets] made me more thankful for US food safety", and "[I] appreciate the U.S., how good we have it … and why biosecurity is important". These observations lead to the development of a 'national self' (or collective self) (Zhu et al., 2017) which, simply stated, is a better understanding of U.S. 'home' regulations and a thankfulness of what they have in the U.S. Specifically, students reflected that "I am thankful for clean water", and "have minimal concern for most food-borne illness", as well as an appreciation for safety regulations for food and driving.

Students disagreed with the statement that animal welfare standards in China are the same as the U.S. and opinions pre- and post-travel were statistically insignificant (P = 0.5). Comments about dairies included "a lot of cows looked unhealthy", and "if most dairies look like the ones we saw, the Chinese will never be able to produce enough milk". A student noted "it was strange to see how far behind they are in dairy production" and commented on outdated milking equipment. Yet comments about other animal farms

Table 2. Students' reported understanding of China agricultural practices, markets, and culture

		Likert scale responses[a,b]						
Statements	**Time**	**1**	**2**	**3**	**4**	**5**	**Mean± SD**	**P-Value**
Current understanding of Chinese agricultural practices	Pre	0.0	4.2	41.7	44.8	9.4	3.59 ± 0.7	
	Post	3.2	1.1	11.7	47.9	36.2	4.13 ± 0.9	0.001
Current understanding of Chinese agricultural markets	Pre	1.0	15.6	51.0	30.2	2.1	3.17 ± 0.7	
	Post	0.0	3.2	17.9	68.4	10.5	3.86 ± 0.6	0.001
I understand the differences in agricultural practices between China and the U.S.	Pre	2.1	19.0	48.4	26.3	4.2	3.12 ± 0.8	
	Post	0.0	2.1	14.7	68.4	14.7	3.96 ± 0.6	0.001
Current understanding of Chinese culture	Pre	0.0	21.9	45.8	29.2	3.1	3.14 ± 0.8	
	Post	0.0	5.3	26.3	57.9	10.5	3.74 ± 0.7	0.001

[a]1=None, 2=Limited, 3=Moderate, 4=Strong, 5=Exceptional
[b]Data are reported as the % of students (n=96) responding within each category

revealed satisfaction with local practices; for example, students wrote that "it was interesting to see how advanced [fish farming] was", "the vertical integration of animal systems with cropping was great to see", and "feedlots were impressive". When discussing animal welfare with Chinese producers, we were told that they can't afford to have the same welfare standards as what we have in the U.S. because they are just simply trying to feed their people and provide jobs (Thaler, 2015, personal communication). Since many of our students had never been faced with the issue of food insecurity, this situation helped them understand that with the challenges of feeding 1.3 billion people, animal welfare sometimes does not receive the same attention that it does in the U.S.

Despite the fact that students tended to disagree or feel indifferent towards the statement that I follow the news related to international agriculture, their responses after travel indicated an increase in consumption of news (P = 0.001). When the concept was worded in such a way as to inquire about their plans to follow news (I am likely to read international articles/view international news) students were more likely to agree, especially after travel (P = 0.001). One student commented, "I gained an interest in foreign policy and trade relations, which I never had even thought of before". Another student chose a career in agricultural policy in Washington, DC after completing the class.

Our students also agreed that their study abroad experience would impact their lifelong career, particularly after traveling in China (P = 0.005). Comments such as "I loved the experience and will be looking for a career where I can travel to China", and that there is "great opportunity for the American farmer to fulfill food needs", and that this experience "sets me apart from other applicants who have not seen the world first-hand reflected this change in attitude. This out of country experience also helped improve self-confidence and personal growth (Table 3). At least one person in every class has told the instructors that they got a job because having an international experience on their resume set them apart from the other candidates.

Students reported a profound difference in their understanding of China before and after the travel experience (Table 2). While their reported understanding of agricultural practices and markets as well as Chinese culture was moderate to strong, they revealed an increased level of understanding in all areas (P < 0.001) after spending time in China. The small cropping areas, the high use of hand labor, and lack of mechanization on farms were surprising to the students. While some of the animal confinement centers were huge (poultry and swine) and highly mechanized, most of the grain farms were extremely small, with crops tended by hand or with very small equipment. Other observations were that every square inch of land appeared to be utilized but there was a lack of efficiency. These observations lead to multiple student discussions on how they would use the knowledge they garnered at SDSU to make each operation they visited more efficient, which developed their critical thinking skills, especially in a group setting, and provided "real world" case studies for them to examine together.

Perhaps one of the most profound findings of this study was the fact that students not only felt more knowledgeable about agriculture, but they also walked away from the experience with enhanced confidence in themselves (Table 3). Most of the SDSU students had limited travel experience, but the post-survey indicated that a large portion of the student would travel again and felt confident that they can better handle unfamiliar situations. Further,

Table 3. Students' responses to express their confidence in themselves, traveling in a foreign country, communicating with others outside the U.S. and discussing agriculture

		Likert scale responses[a,b]						
Statements	**Time**	**1**	**2**	**3**	**4**	**5**	**Mean± SD**	**P-Value**
I am confident in my abilities as a person	Pre	1.1	3.2	19.0	39.0	37.9	4.09 ± 0.9	
	Post	1.1	2.1	5.3	42.1	49.5	4.37 ± 0.8	0.01
I am confident in my abilities traveling in a foreign country	Pre	2.1	5.2	33.3	34.4	25.0	3.75 ± 1.0	
	Post	3.2	2.1	9.5	41.1	44.2	4.21 ± 0.9	0.001
I am confident in my abilities communicating with people outside the U.S.	Pre	1.0	11.5	40.6	33.3	13.5	3.47 ± 0.9	
	Post	1.0	6.3	16.8	46.3	29.5	3.97 ± 0.9	0.001
I am confident in my abilities discussing agricultural issues, practices, and markets	Pre	1.0	12.5	28.1	43.8	14.6	3.58 ± 0.9	
	Post	2.1	2.1	10.5	59.0	26.3	4.05 ± 0.8	0.001

[a]1=Strongly Disagree, 2=Disagree, 3=Indifferent, 4=Agree, 5=Strongly Agree
[b]Data are reported as the % of students (n=96) responding within each category

they reported a robust increase in their confidence with traveling internationally and communicating with people outside of the U.S. Students also felt better able to discuss agricultural issues, practices, and markets as a result of their experiences in China. This increase in self-confidence has been reported in other studies (Sachleben, 2016; Zhu et al., 2017).

It would be appropriate to conclude that students who participated in the China Ag course demonstrated growth as a result of their experience in China, particularly related to culture and agriculture. Ninety-three percent of students indicated that they planned to travel back to China (Table 4). It should be noted that three students returned to China by themselves for one-year teaching programs at China Agricultural University with our host professor. Students also reported a few key areas where they did not experience a change in perceptions or views as a result of their participation (Table 4). After studying abroad 16% more students ($P < 0.001$) indicated that they would work or intern in China. This expressed desired is consistent with the needs of the international agricultural industry. One point that was specifically driven home by the head of Pioneer DuPont China was that if students wanted to advance to the higher ranks in any international company, they would have to spend 3-5 years at a foreign post. If they chose not to do that, they could still do well within the company but may experience fewer opportunities for advancement. Finally, since most students said they would recommend this course and international experience to others even before leaving for China, there was no difference in their response to this statement before and after travel ($P = 0.996$).

International travel presents opportunities to expand a person's worldview and to confront things often taken for granted. Post-class reactions to the trip revealed that students gained confidence outside of their comfort zone and became more humble or appreciative of the opportunities that are afforded to them. They were surprised that "literally every square inch of space was used" in China and that people don't require as much "personal bubble" space. One student reported "I am grateful and more appreciative for what I have in the U.S.", while another said the experience "has made me more rounded in global views", and others stated this "made me more open to travel". When asked what surprised them most, the most common open-ended responses had to do with wet markets, sanitation/ food safety, and the scale of farms and ports (Table 5). Several students commented that the experience "made me appreciate the U.S. much more" especially pertaining to environmental and food safety regulations.

Success in our increasingly connected world is predicated upon having a global mindset and the ability to work with people from a variety of backgrounds. Three major themes emerged when students were asked how they felt this international experience would prepare them for a life-long career (Table 6). Nearly 30% of students said their new knowledge of global markets would be a key factor in career success. Several students felt that new perspectives of broadened horizons (15%) and knowledge of differences between countries (12.6%) would provide an advantage to their career. One student shared that this course "helped me gain insight into more possible career options that I had not considered." Others indicated that they would be more

Table 4. Students' level of agreement with statements related to travel, work, and recommendations

Question	Pre[a]	Post[a]	P-Value
Would you travel back to China?	--	93%	--
Would you work or intern in China?	37%	43%	0.001
Would you recommend this international course/experience to other students?	99%	100%	0.996

[a]Data are reported as the % of students (n=96) responding to the affirmative

Table 5. Summary of student responses to the question "what was the one thing that surprised you the most?"

Student responses	% of related responses	Total number of related responses
Meat markets/wet markets	18.2	24
Poor sanitation/safety	13.6	18
Scale of ports and farms	13.6	18
Crowdedness of people/space	11.4	15
Inefficiency of manpower	9.1	12
Driving conditions	8.3	11
Condition of animals on farms and in markets	5.3	7
Other	11.4	15

Students were permitted to provide multiple responses. n=132 total responses.

comfortable traveling abroad for business and that they have a basis for understanding different cultural norms.

The China Ag experience at SDSU directly reflects our institution's strategic plan. We achieved transformative education through our commitment to globalizing the agricultural curriculum. We further cultivated and strengthened community partnerships and education through our collaborations with strategic local and global professionals as well as our requirement for students to publish highlights from their experience in the local papers. While the China Ag experience did not directly require students to partake in original research or creative activities, two students elected to expand upon their experiences in China to fulfill the requirements of the Honors College. One student interviewed Chinese dairy farmers and wrote a white paper assessing practices in China and the U.S. Another student approached one of the China Ag instructors to mentor her on an intensive three-credit honors independent study about agricultural practices in China. These two instances of an agricultural focus within honors education, while rare on the national scene, are reflective of ongoing efforts within the SDSU campus to emphasize agriculture within honors courses and scholarship (Nichols et al., In Press) and outside of the classroom (Bott-Knutson et al., 2019). Combined, the alignment of the China Ag experience with our institutional strategic plan and with other campus initiatives has created a sustainable and popular enriching global experience.

Summary

The China Ag course was designed to help students see connections to others worldwide and to understand the richness that diversity provides for all. Through the development of global learning outcomes and strategic local and global partnerships, we've globalized this agricultural course. As a direct result of the China Ag course, student self-awareness, confidence, knowledge, and openness to international experiences were enhanced. As the world becomes a smaller, more internationally connected place, students are prepared for a more integrated future.

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Making It Matter Before, During, and After; The Impact of a Nicaragua Study Abroad Trip For First-Year Undergraduate Students

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Abstract

This case study explored the impact of a combined course and study abroad program for first-year students from the College of Food, Agricultural, and Environmental Sciences (CFAES). The program employed Roberts' and Jones experiential framework to enhance students' overall experience and learning when partaking in a study abroad experience. Students engaged in reflective activities before, during, and after the study abroad experience through purposeful directed journaling and guided group discussions. To assess the impact of this program, journal entries were qualitatively analyzed using in-vivo coding to identify key themes that emerged at different stages of the program. Themes that emerged before the experience included perceptions of poverty and reflections on how the student might deal with novel and/or uncomfortable experiences. During the experience, students detailed their first reactions, homestay experiences, and the experiences of agricultural site visits. These entries often invoked discussions from before the experience. After the experience, themes included the impact the trip had on each student and the challenge of sharing the experience with loved ones back home. We conclude by suggesting additional steps to enhance students' continued learning.

Introduction

The Ohio State University has committed to the Institute of International Education's Generation Study Abroad initiative, a five-year project that aims to double the number of U.S. students studying abroad by the year 2019 (Office of International Affairs, 2017). This initiative is engaging with faculty across the university to develop strong programs that provide more students with opportunities to have international experiences that impact them as people and in their future careers. In 2017, only 150 students from the College of Food, Agricultural, and Environmental Sciences (CFAES) took part in a study abroad, compared to the college of Arts and Sciences, which provided 961 students with international experiences (Office of International Affairs, 2017).

As the agricultural industry becomes increasingly globalized, students in CFAES have more incentive to learn about agriculture outside of the United States. Moreover, research indicates that international learning experiences provide students with opportunities for personal development along with career enhancement, unique curricular experiences, and to build cross-cultural skills (Hoffa and DePaul, 2010; Rubenstein, Fuhrman, Duncan, and Conner, 2018; Twombly, Salisbury, Tumanut, and Klute, 2012;

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Zhai and Scheer, 2002). To optimize a program's capacity to offer an impactful experience, scholars recommend incorporating intentional reflection activities (Lamm et al., 2011; Perry, Stoner, and Tarrant, 2012; Roberts, Raulerson, Telg, Harder, and Stedman, 2019; Sankey Rice, Foster, Miller-Foster, and Barrick, 2014).

This paper assesses the impact of an international learning experience for first-year students from the CFAES. The program was developed using Roberts and Jones' (2009) experimental framework for international experiences (Roberts and Jones, 2009), and focused on the state of agriculture in Nicaragua and environmental sustainability.

Theoretical Framework

Roberts and Jones' (2009) provide an experimental framework to enhance the cognitive and affective experience that students have by implementing reflective learning activities before, during, and after the study abroad experience.

Before the Experience

Prior to partaking in an international experience, learners need to be prepared and develop skills that will help them in the learning process. Jones and Bjelland (2004) refer to this time-period as preflection. For students, preflection involves growing aware of logistics, expectations, and learning or co-developing objectives set for the international experience (Rodriguez and Roberts, 2010). Students also learn the process of reflecting upon experiences, whether in facilitated group sessions or through independent activities, like directed journaling (Jones and Bjelland, 2004).

For the facilitator, the preflection period involves confronting the various emotional states of participants. Some participants may express anxieties or worries which should not be neglected, as such emotions can inhibit learning (Caine and Caine, 1991; Zull, 2002). (Caine and Caine, 1991; Zull, 2002). Facilitators should provide detailed information about the impending experience so as to appease negative emotions.

Another important task for the facilitator is to establish existing knowledge within the group of participants. By gaging where participants in the group are, the facilitator can adjust activities to ensure that new knowledge builds on previous knowledge (Vygotsky, 1978).

During the Experience

As students begin their international experience, they are likely to be flooded with new sights, sounds, ideas, and feelings. Consistent guided reflection sessions are key to supporting learning throughout the experience. Reflections may be in the form of directed journaling, where students are able to reflect individually, or through well-facilitated group reflection sessions.

In addition to frequent reflection sessions throughout the experience, facilitators should be purposeful in helping students focus on key learning points through what can be an overwhelming and overloading environment (Sweller, 1988; Zull, 2002).

After the experience

To extend learning past the international experience, facilitators should provide opportunities for reflection after the trip is complete and motivation for future learning (Roberts, 2006; Roberts and Jones, 2009). In post-reflections, students make further connections and develop more complex understandings of the experience they have had (Zull, 2002).

Methodology

This case study considers the experience of 25 first-year students who participated in a nine-day international program to Nicaragua in 2017. Participants included 20 female and 5 male students between the ages of 18 and 20 who self-selected to participate in the course. Prior to departing, students engaged in a 16-week course where they met weekly with their fellow participants and resident directors. Each class was set up to encourage learning about the locations the students would be traveling to and focused on challenges in agriculture and environment specific to Nicaragua, while also broadening to a global scale. The students engaged with guest speakers, guided group discussions, and directed journaling. This allowed participants to learn and start their process of preflection in multiple formats under the direction of their resident directors.

Throughout the 16-week course, the 9-day trip, and two weeks after returning from the experience, participants completed up to 13 open-ended journal entries based on given prompts (Table 1).

All journals were collected and transcribed for content analysis using QSR International's Nvivo 10 Software. Open coding was used to identify key themes that emerged from participants' journal entries at different stages of the process (Creswell, 2014). First, codes were established based on term frequency using Nvivo's auto-coding tool (QSR International, 2018). These codes were scrutinized for redundancy and consolidated. We then conducted a line-by-line content analysis, forming chunks (words, sentences, or phrases) to verify codes and allow for emergent codes (Krippendorff, 2018).

Results

Before the Experience

During the 16-week course, directed journaling targeted the agriculture and environmental content of the course and encouraged students to explore their current understandings of the world by writing about their perceptions of a developing nation or of poverty. Journal entries for Prompt 3, where students described their perspectives of a developing nation, revealed several common themes. Nine students' perceptions of developing nations included people living in poverty and in huts or "run-down homes" (Student 015, Student 020, Student 023). Other prominent

Table 1. Directed Journaling Prompts

Prompt #	Prompt questions and directions	Stage of trip
Prompt 1	Many of you have not been to a developing nation. What do you think Nicaragua will be like?	Before
Prompt 2	Why did you decide to come on this trip?	Before
Prompt 3	What do you think of when you hear a place described as a developing nation? • Be as descriptive as possible… what perceptions do you have? What images come to mind?	Before
Prompt 4	There can be strong, differing opinions when it comes to conservation of natural areas and the need for agricultural production… • How do you go about forming your opinion on the matter? In other words, how do you make up your mind on a topic like this? • When speaking to someone with a different opinion than yourself, how do you engage in a conversation with them?	Before
Prompt 5	What does poverty look like to you? Describe your thoughts here in detail. • Where do your ideas come from? • How do you engage with someone who's reality could be very different from your own? • What could make it difficult to relate to someone living in poverty?	Before
Prompt 6	How do ethics play a role in what we grow/produce, make/manufacture, and purchase?	Before
Prompt 7	In your opinion, what are basic human rights? • Where do these ideas come from? • How do you feel/react when you see those rights (you mentioned above) are not being upheld? • How do you think those rights play out in Nicaragua?	Before
Prompt 8	Often times, developing nations are the recipients of international aid. Americans are often able to go into these countries and give or provide some kind of support. • What is your opinion of the US providing international aid to under-developed countries? • What do you think might be some good effects of international aid? • What could be some adverse effects?	Before
Prompt 9	What makes it difficult to learn about other cultures? • What are some of the areas of the CQ assessment that you struggle with when you encounter them?	Before
Prompt 10	Have you ever experienced a situation where you did not have (prolonged) access to sanitation? If so, how did this feel? • Knowing what you know about all the issues facing people in developing nations, where would you rank the importance of sanitation and why?	Before
Prompt 11	First impressions	During
Prompt 12	The homestay experience	During
Prompt 13	What are your observations of ag and environmental sustainability and the impact on Nicaraguan families?	During
Prompt 14	Final reflection • It's been a week since you have been home. How was it to be home and tell your story? What are your reflections from the trip now that it was been a week away? What will you do with what you learned, saw, explored, etc.?	After

themes depicted developing countries as being dirty, having poor infrastructure, a lack of food or water, and government issues. Six students presumed that developing nations predominantly relied on agriculture for employment.

Prompt 5 asked students to answer the question: "what does poverty look like to you?". Again, there were multiple common themes across responses similar to those identified in Prompt 3. However, a few depictions of poverty greatly differed, as shown by the following two students:

> To me, poverty looks like old run-down building, families having to find a place to stay that at least has a roof for keeping weather outside…Their kids are peaking out of the houses with sad eyes and skinny malnourished bodies. My ideas of poverty come from the pictures and videos of families in other countries. I've never experienced it firsthand. So, everything advertised as poverty is the image I have for it (Student 001).

> Poverty = inequality. Unequal opportunities to earn an income, an education, a life. It is being trapped in a minimum wage job to support a family. Poverty prevents people achieving their full potential. But poverty is a spectrum. Like I described poverty in America,

> poverty in another nation would look completely different. Poverty incorporates politics, race, gender, sexuality, location, environment, health. (Student 005).

Through journaling, students also began to consider how they will deal with novel experiences, some of which might be uncomfortable. Prompt 10 asked students to consider how they will navigate different sanitary situations that they are likely to encounter. Four students related going without sanitation to times spent camping. Students overwhelmingly ranked sanitation as highly important and had negative associations with the idea of being without. One common theme was that a lack of sanitation is bad for health, as illustrated by the following excerpts:

> I would rank the importance of sanitation pretty high because sanitation is pretty much the basis of health. Lack of sanitation leads to an immense amount of problems. If people have good sanitation, it leads to good health (Student 002).

> When someone who lives in a country where it lacks sanitation they face the risk of spreading disease to other humans or animals (Student 008).

Prompt 4 asked students to reflect on how they might approach a conversation with someone who has a differing opinion. Responses had common themes of being open-minded, respectful, and listening to people whose ideas differed from their own. In addition, students showed personal reflection:

> When engaging with these people, I tend to stay respectful, but I won't lie, after the fact I need deep breaths away from them (Student 011).

Students also explored their ideas of "basic human rights" and reflected on how they might react if they see that those rights are not being upheld (Prompt 7). Prominent themes included the right to vote, marry, freedom of speech, access to water, food, education, healthcare, and shelter. In contemplating how they might react when observing that their notions of basic human rights are lacking, students expressed sadness, anger, fear, and uncertainty. These themes were exemplified in Student 009's journal entry:

> If I were to see rights not being upheld for an individual, it would be very emotional. I would be angry at the lack of respect, and I would want to fight to make things right. However, I do recognize that other countries may hold a different perspective on what basic human rights entail (Student 009).

During the Experience

Once the group departed for Nicaragua, the students continued to engage in processes of reflection at multiple stages of the trip. Students were responsible for completing three directed journaling prompts to reflect on their first reactions, homestay experiences, and the agricultural site visits.

First Impressions

Themes from students' first reactions journal entries (Prompt 11) comprised descriptions of the environment, comparisons to U.S. culture, characterizations of the people, and emergent feelings.

Students primarily described the environment in terms of Nicaraguan food and the colorful environment. These attributes were observed in most first reaction responses. In several cases, color and food were woven throughout these prompts to compare Nicaragua to the United States, as Student 002 does here:

> It is so colorful here. That may have been the first thing I noticed…I was shocked to see that security room that was bright bubblegum pink. There isn't really a place in America, definitely not an airport, where you would just have a bright pink room (Student 002).

Another consistent theme was characterizing Nicaraguan people. Students used words like warm, welcoming, kind, hospitable, different, optimistic, and outdoorsy. In describing Nicaraguan people, several students articulated their changing perceptions, as demonstrated by Students 016 and 007:

> Seeing the way people live really struck me hard when we first took that bus ride to the first hotel. I assumed that living this way would make a lot of people sad. As we have gotten to interact with people, I don't think I was right about this. Everyone seems happy to talk to us…It is amazing how everyone lives so entirely simple and yet still are happy (Student 016).

> My first impression of Nicaragua was that it was a less developed country and the people were more desperate for money and for opportunity. Now, especially after meeting locals and holding a small conversation, I have begun to realize that yes this is less developed country, but it is growing, and its amazing people are working hard to get by. One thing I admire is the sense of joy and positivity emanating from the community, even with being a developing nation. I think that this positivity and optimistic attitude is something that the U.S. people lack. Only spending one day interacting with the people of this beautiful country and my perspective is already changing and my impressions are definitely different from my first (Student 007).

In addition, students revealed how they were feeling in their first few days of the experience. Six responses described feelings of culture shock and five discussed how their perceptions were changing, as indicated above. Students articulated emotions ranging from feeling excited, awestruck, and nervous.

The Homestay Experience

Journal entries following the homestay experience (Prompt 12) were detailed and descriptive. The central topic was the "host mom". Students wrote about the kindness of their host moms and several described feeling connected

to them.

> I'm definitely not an emotional person but leaving (my host mama) and the family was heart-breaking. I think the love she showed (my roommate) and I was what made her so special (Student 001)

> My mother showed me so much love over two nights even though the language barrier limited our communication. Whether it be the endless food she piled on my plate or the amenities she shared in her house, she opened herself and her culture to me and I couldn't be more honored and grateful for that (Student 005).

Students also made observations about the daily lives of their host moms, especially in comparison to what they saw the men of the area doing. Students had preflected on potential differences in gender roles prior to leaving for the trip, which was evident in their journaling of the homestay experience, as evidenced by the excerpt:

> I think the gender roles are pretty similar to what we discussed. The mom is in the kitchen and the dad is in the field (Student 001).

Students thoughtfully detailed gender roles they saw playing out, sometimes comparing them to their experiences in the United States:

> Seeing my host mama multi-task without help and not complain but rather just be content and independent was definitely a lesson for me. I grew so much love for her so quickly because back home I could never imagine asking my mom to work physically all day and expect dinner without helping her. It didn't make me think poorly of the rest of the family, but it definitely made me think about family dynamics and gender roles (Student 009).

Each student characterized and described Nicaraguans as being "hard-working" and were especially admiring of the host mom's capacities. This theme also came out when discussing gender roles, as in the following quote from Student 002:

> But just because the women mainly take care of the kids and cook, they are just as strong and hard-working as the men and in the coffee fields I greatly admire their clarity and grit, men and women (Student 002).

After the host mom, children were the second descriptive theme for Prompt 12. Students reflected on scenes where they played with young children in the household, sharing gifts with them, and laughing over communication barriers.

Responses also included students' emotions at different points of the homestay experience. Students described feeling nervous, uncomfortable, or awkward on their first night with their host families.

> The homestay was the part of the trip that I was most nervous about…I felt a little uncomfortable until I actually tried to communicate with (my host mom)– we weren't able to verbally communicate completely but the amount of smiling involved was much more than I think I have ever experienced. I knew from our exchanges, however, they occurred, that (my host mom) was glad to host us (Student 014).

> Night number one was extremely awkward, my roommate and I spoke little Spanish and our host family spoke none at all. For the first hour or so they were occasionally speaking Spanish to each other and Jessica and I were speaking to each other in English. Our host mom started making dinner and then eventually asked us if we wanted to try cooking with her. I was so excited for the awkward silence to be over, we gladly accepted her offer. When we walked in the kitchen she had us fry the plantains, I was nervous to eat them, but they were actually pretty good (Student 008).

Several students discussed feeling inspired by their homestay experience and their host families.

> When we were sitting in the community center listening to the women's cooperative, I was astonished by how much they had accomplished. I was just in awe of how powerful these women are, and in my eyes, that is what being successful is. It is very inspiring to me, and I think they deserve all of the good things they receive because they earned it (Student 014).

> I guess what amazes me the most is the love these people have to give. People we view having so little seem to have so much to give, it's truly inspiring. They're a truly happy people and being around them has impacted my way of thinking greatly (Student 019).

Agricultural Site Visits

The final in-country directed journal prompt that the students were responsible for asked them to describe the agricultural experiences that they had in Nicaragua (Prompt 13). The predominant theme that emerged from these reflections was sustainability. Students described multiple examples of sustainable agricultural practices that they saw along their trip, characterizing these practices as empowering and caring and comparing them to agricultural practices in the United States. Several students related the efforts to use sustainable practices as a mark of Nicaraguan pride:

> Not only do I think it is important for their crops that they are sustainable, but it is also a source of pride for these families. This land is very beautiful, and they realize what they have (Student 009).

> The people of Nicaragua, especially the farmers that we met with have so much pride for their country and the land. The land is a part of who they are. It is so awesome that they are trying to protect it, and I hope that this sense of pride and connection can be brought back to the

United States. I think that money can often overshadow pride and make people do things that would not have imagined because they are not desperate (Student 002).

After the Experience

Two weeks after students returned from their international experience in Nicaragua, they submitted final reflections (Prompt 14). Across the final reflections surfaced the theme of struggling to share the experience with friends and family back home.

> Most people have short attention spans despite their best effort, and they are most interested in where I went and what I saw than what I learned about people and about myself. For better or for worse, I focused on the beauty of the country when I knew I was talking with someone who wouldn't stick with the conversation long enough to truly understand what the trip meant to me. Mostly, my friends and family were amazed by everything about the trip. By the end of each conversation though, it would strike me again how blessed I am to have had such an opportunity (Student 002).

> Sharing my experience to family, friends, teachers, and others has been a challenging task. Most people I talk to are only interested in learning if the experience was fun, but nothing else (Student 005).

> While I was telling my stories, I felt at some points it was hard to share my experiences because only the 26 other people with me could fully relate to my experiences (Student 008).

The reflections were both self-reflective and descriptive of the people they met. Many exalted the new friendships they made with fellow travelers, whom they shared a unique and sometimes uncomfortable experience with. All students wrote about the Nicaraguan individuals that they met, from the host family visits to the agricultural sites.

Each student characterized Nicaraguans as "hard-working" or having a "strong work ethic". Students repeatedly remarked how Nicaraguans were "joyful" or, as Student 011 writes "it's so nice not to need anything or much and still be unconditionally happy like the people of Nicaragua". Another student shared a similar sentiment:

> These people are utterly happy with their lives. What little belongings they have, they worked hard for which added great value to everything in their lives (Student 012).

This theme of making a lot out of a little was common in each final reflection. Students compared this attribute they saw in Nicaraguans to people in their own lives in the United States and considered ways that they could embrace Nicaraguan practices.

While reflecting on their trip, students identified specific ways that the trip sparked behavior change or shifted something in their future goals. Some ideas were abstract, like being "more open-minded" or having a stronger "work ethic", while other students identified specific ideas:

> The trip to Penas Blancas inspired me to start a club at OSU to support the women in the community. This club could connect students to these women and help sell their products to people at the university and the Columbus community. I believe even this small gesture could help the women and the people in that community greatly (Student 009).

The final reflections also divulged ways that the trip impacted students; they wrote about how the trip changed their perspectives on agriculture, poverty, and generally their "outlook on life" (Student 022; Student 009; Student 004). The following excerpts illustrate students' shifted perspectives:

> An experience like this one can really put things into perspective in your own life. Some people may look at the homes of the people in Nicaragua and feel sorry for them because it might seem like so little compared to what they have personally. But really, it's not less, it's just different. The way that my host family lived was so beautiful (Student 018).

> I learned so many different perspectives, and really reflected on how different Nicaragua is than the US, but also how alike we are, and how much we can learn from each other (Student 023)

Finally, every student conveyed gratitude and appreciation for the experience, as illustrated by the following responses:

> My first study abroad experience broadened my horizons in more ways than I can begin to explain, and I am extensively grateful (Student 004)

> This trip taught me more than I ever thought it could and I am beyond grateful that I was able to go on this trip. I met such amazing people and I experienced a few once in a lifetime things. I will never forget the time we spent there and I hope to make my life reflect some of the astonishing lessons that I learned (Student 020).

Results and Discussion

Several factors that contribute to the success of a study abroad program to meet it's intended outcomes. In this case study, we employed Roberts and Jones' (2009) framework to promote personal development in students, using purposeful learning strategies to improve students' cognitive and affective experiences before, during, and after the study abroad program.

Before the Experience

The learning activities and conversations initiated before the experience strengthened the students' comfort level and overall enjoyment during the trip and increased

their ability to process the trip upon their return home. As previous studies contend, we found that providing students with information prior to travel enhanced their psychological preparedness to observe and consider cultural differences (McGowan, 2007; Rodriguez and Roberts, 2014; Tritz and Martin, 1997). This came out especially in homestay journal entries, where students deeply analyzed the gender roles playing out within their homestay families, consistently linking it back to what they had previously learned. That said, before-the-experience journal prompts and class discussions that focused on issues that may seem more trivial, such as differences in hygiene and sanitation, also re-surfaced in later journal entries. The students benefited from receiving and processing a variety of information to prepare them for the trip.

During the Experience

The on-going opportunities to address experiences whilst on the trip were also important, as students actively applied course content to the environment. Again, students were provided varied formats, through guided group discussions and directed journaling. In addition to voluntarily journal entries written throughout the trip, three directed journaling prompts helped students reflect on specific experiences and areas of study.

While the various excursions to agricultural sites provided students with content-specific learning opportunities, the homestay experiences provided an informal environment to interact and engage with families from Nicaragua. These experiences can distinctly impact students, giving them a sense of connection to individuals from the host country and the opportunity to develop intercultural competencies (Twombly et al., 2012). However, to ensure homestays are a positive experience for both the students and hosts, both parties should receive preparation before the trip. In this case, the students addressed issues likely to arise through facilitated discussions and directed journaling before the experience. In addition, host families participated in sessions prior to receiving their guests to prepare themselves for the cultural differences they would face and learn strategies to best respond to them. Providing both parties with preflection opportunities prior to intergroup contact created the conditions for positive engagement between students and their hosts during the homestay.

After the Experience

Final reflections were completed two weeks after returning home from the study abroad program, allowing students a short period of time to process the trip. Primary themes included: the challenge of sharing their experiences with loved ones back home, the impact on an individual level, inspiration for further action, and gratitude for the opportunity.

Each student wrote about the impact the trip had on them on an individual basis, describing how it changed their perspectives. Several students also indicated that the trip inspired ideas to continue working with those they had met on their trip, both from the group they traveled with and their hosts in Nicaragua. Further resources and social networks are recommended to help students stay connected to the experience and the people they met. If available, students should be pointed to available resources at their home institution, which can offer ways to share their experiences with other students and ways to get involved in university groups (Office of International Affairs, 2018). We also recommend establishing social network groups prior to completing the experience so that students have an easy way to stay in touch and share further opportunities to engage with each other and in the topics covered in the course. This could also act as a resource for future students who are interested in the course and want to connect with those who have had the experience.

Summary

This study explored the impact of a study abroad program comprised of a one-semester course and travel experience to Nicaragua focused on agriculture and environmental sustainability. The program benefited from using Roberts and Jones' (2009) experiential framework for international experiences, which recommends using purposeful learning activities before, during, and after the travel component of the program to support students' cognitive and affective experiences. In particular, reflection activities such as directed journaling and guided group discussions allowed students to consider their existing perspectives and knowledge, actively process new information, and prepare for further learning. This type of pre, during, and post reflection and processing cannot be understated; it lessens the 'shock' of a new place allowing the student to process the experience critically and take more from their time in the country.

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Skill Set Needs of Natural Resource Managers: Derivation From Case Studies, Field Based Education Argument and a Proposed Decision Making System

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Abstract

A myriad of data-elements and technologies are now available to influence the opinions and land management decisions governing agricultural development, water quality management and land-utilization actions. Becoming familiar with these as a professional or learning to embrace these at the student-level are crucial in contemporary society which depends on informed, inclusive decision-making to ensure resource equity. These decisions must now must be considered in the framework of global climatic disruptions including global warming, nitrogen enrichment, and greenhouse gas emissions. Information sources include: empirical scientific studies, economic imperatives, aesthetic, ethical and cultural values. Methods to handle and integrate these various elements into judicious decision making is challenging in the face of uncertainly (e.g. natural variation), imperfect understanding of systems, incomplete data, or combinations. These realities require understanding through more meaningful, associative- and active-based learning. These formats include: co-creation, co-innovation, application, hypothesis-testing and evaluation. This level of engagement requires providing information within a "real world" context, as this kinesthetic approach integrates and engages the full range of knowledge transfer mechanisms. The authors use field-based examples of active learning to deliver concepts of ecosystem security using global models based in New Zealand, Mongolia and the United States (case studies). Such training has the potential for inclusion in school curricula, but requires advocacy and research-support from external participants (access to levels of science and technology, licenses to operate including insurances, visas, travel and photographic consent). This will require instructors to employ methods which move from factual through conceptual and procedural to metacognitive. The authors also have found in their own classes, especially where natural resource decision making is concerned, experiential learning in the field (broadly meaning interface with the natural world) is an essential part of such curricula no matter the age or cultural categories of students. This has aided the development of skill sets the authors content are needed by current and future natural resource managers. These integrate best information, ecosystem use ethics and embrace diversity.

Introduction

"It is a cosmic joke. [Man's] preoccupation with survival has set the stage for [his] extinction." (Steinbeck, 1954, p. 147).

Globally humans are faced with the daunting challenge of producing 50% more food, 50% more energy and making 30% more freshwater available by 2030 (Beddington 2009). Suppose, however, that as a global society of natural resource managers we meet these goals: what then? What must we do to achieve food demands of 2040, 2050 and

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beyond if population growth exceeds resource availability? The problems are multidimensional and complex, and the solutions need to address critically urgent issues, as well as addressing longer-term, protracted threats, operating at local- and global scales. Integration into, and discussion of these "global challenges" in a single curriculum is challenging. It is our contention that achieving salient answers is possible only through first an overview of existing and past decision makings; un-packing the issues, and then incorporating the lessons learned from these past experiences into a robust, and defendable "decision making framework". Humans all exist geographically and culturally within the food-water-security nexus. All three elements impinge, with considerable variability, on current and future natural resource management. The challenge of providing resources for 7.2 billion people, while operating within the constraints of planetary boundaries (Steffen et al. 2015), is at best daunting. There is an argument that natural resource management needs to be done differently than in the past. At the most fundamental level, managers need a change to the skill sets they develop in formal education as well as those they hone as professionals. The authors build an argument herein using case studies and Bloom's Taxonomy (1956) of teaching, to achieve deeper levels of understanding through meaningful learning, associative- and participatory learning platforms. This approach requires moving away from "rote-learning" and "tell me what I need to know to pass the test," to deeper levels of understanding; involving co-creation, application and evaluation (Krathwohl 2002). We realize that in the certified teaching profession, what we have discerned is nothing new, but established for 60 years or more. However, among certified science professionals, that also have classroom mandates, teaching towards higher order thinking skills is lacking if not rare. This level of engagement under the best circumstances requires the delivery of information within the "natural world", in a participatory, active-learning environment.

Related to learning styles and intelligence, Gardner (1983, 2000) identified that instructional organizations, and particularly those focused on science, technology, engineering and mathematics (STEM), usually focus mainly on verbal-linguistic and logical-mathematical skills, but these usually fall into just two of Gardner's eight categories of intelligence. Some students who are weak in these areas may be highly intelligent in other areas. For example, 1) Bodily-kinesthetic – do well with physical activities, and therefore learn best through hands-on experience; 2) Interpersonal – do well with social experiences and therefore learn best through interacting and discussing information with others; 3) Natural – students with high natural connectedness do well when they can learn in the "real world," often outdoors. We integrated these three learning styles into a field based and activity learning model as essential components of a participatory teaching platform, with a focus on active learning in the land management decision making arena, which includes the biosecurity arena as well as agriculture, energy development and water availability.

The aims of the paper are to:

1. Describe case studies including some involving students in active learning pursuits based largely in field environments.
2. Synthesize educational outcomes from these case studies and together articulate as skill sets.
3. Provide generic principles for activity-based learning focused on natural resource management decision making.

Methods

Teaching and conveying the skill-set necessary for informed, decision-making processes are key to Natural Resource Management curricula. These curricula, require an educational experience where participants are exposed to quantitative and qualitative information and research methodologies. Additionally, a spectrum of complimentary arenas including the natural sciences are embodied and embedded in the social sciences, especially in understanding human decision making and methods to incentivize behavioral change. But in the decision-making process, there are other skills that the next generation of decision makers need to hone. Part of our realization here is that we recognize these skills are very frequently lacking in the current generation of decision makers and have been lacking or absent in past generations. We have chosen to address the importance of a needed skill set by examining a diversity of case studies that identify one or more of the given needed pre-requisite skills. The case studies presented are based on our own experiences, and are contextually situated in natural-areas, where resource-acquisition constraints impinge on environmental, cultural, and social values. From an examination of the commonalities, dissection of the issues, and reflective-analysis, we generated a skill-set to empower future environmental decision-makers to contribute to the achievement of durable, mutually-beneficial and sustainable outcomes.

In taking a conceptually developed curriculum to one that can be actualized with students, there are several processes and functions that require attention. We touch on these here because consideration of these aided in selection of the case studies detailed in the results.

1. Co-creation of the class curriculum with students: The approach applied is a student centric, collaborative, and participative practice teaching model for imparting principles of environmental sustainability within the context of natural resource management. The model is a learning and teaching method undertaken 'with' rather than 'for' students, and its process and outcomes are owned by the student/instructor team (e.g. Tsien and Tsui 2007). In this approach, the student-participants proposed the "question" or made the "observation" which in turn formed the basis of the hypothesis building process. Thus, the scientific method begins.
2. Development of investment strategies to support the project: Once identified, the scale of the project dictated the level of the investment necessary to support the endeavor. Development of financial strategies are

necessary for some field/site-based activities to enable payment for transportation, accommodations, and purchasing of specialized equipment to enable the studies to be undertaken in other nearby locations, other states (or the equivalent) or countries. In one case study, fiscal resources were secured through a competitive, proposal-based model, in which the research partner / advocate co-created the proposed activities with teachers and students from the primary school. The proposal was submitted to the central government of New Zealand under the banner of "Unlocking a Nation of Curious Minds." In a second case study, the form of support was through the advocate engaging various members of the International Research and Outreach Program of the University of Wyoming for support of an international scientific, social and cultural exchange between the USA and New Zealand. Both approaches required investments of time and resources by the study advocates.

3. Achievement of cultural, social and legal licenses to operate: As part of the funding process will be the review of the legislative, cultural and social constraints that need to be addressed before undertaking activities off-campus. These require planning and also may necessitate consent and also require further support staff / student advocates to be engaged to assist with the supervision.

4. Logistic considerations: Engagement with an in-country usually governmental but sometimes a non-governmental entity enhances the logistic co-ordination for out-of-country experiences.

Results

Case Study 1: Biosecurity and Exotic Species management in New Zealand, North Island.

Between December 2012, and January 2013, the authors conducted a field-based experiential class that examined exotic species on the North Island of New Zealand. Although there were organizational and orientation meetings held in human-made structures and attended by the student participants prior to launching of the class, the experience was almost completely field based in outdoor settings but also in some laboratories and museums. Of twenty participants, 19 were from The University of Wyoming in the USA and one from New Zealand. Four participants were from other countries (Canada, Nepal, Republic of the Congo and Australia).

The objectives of the course were to examine exotic species in New Zealand and cover a cross section of organisms that included examples that were advantageous to New Zealand, those that were largely neutral in terms of their impact, those that were invasive and often problematic and especially those classed as "noxious" – displaced taxa attributed with negative environmental outcomes.

There were principles of biosecurity, cross cultural communication, pest-eradication, decision making, using best available information and practices, and cooperation that became the structural and functional input to the course. The nexus between rapidity of information generation, unqualified dissemination and immediacy of acquisition, juxtaposed against the often-slow rate of credentialing and decision making was made apparent to the class. This sometimes painstakingly slow process on the heels of such rapidity of generation was central to what the students identified as a clash between the cultures of end-users, consumers, scientists, philosophers, and the students themselves. This type of acrimony has been observed in other classroom-based, field-based and laboratory based educational events catalyzed by the authors. However, this clash was magnified in this 2012/2013 course. Many of the individual student's final personal projects (which scanned the spectrum from biological and agricultural sciences, journalism, and creative writing, to chemical engineering, medicine and astrophysics) focused on this clash of cultures being at the center of unsuccessful decision making. The awareness and lack of awareness by decision makers of this nexus has become more apparent as we have entered more instructional and real decision making scenarios in the author's respective disciplines.

Case study 2: Hetch-Hetchy: [USA, California].

Considerable controversy developed over the building of Hetch-Hetchy Dam in Yosemite National Park during the decision-making period 1901 through 1913. The reservoir would provide water to the rapidly growing city of San Francisco. The conflict was mostly between the forces pushing for development (Gifford Pinchot and others) and those wanting preservation (John Muir and others). The decision to dam the Tuolumne River and create the reservoir was largely a political decision, although it was supported by a report of an advisory board of army engineers, which admitted there were several other possible water sources. However, the report stressed that the site where the least expensive dam could be built and would generate the most electricity was the Hetch-Hetchy (Udall, 1963).

The Hetch-Hetchy decision was made long before the United States legislated the National Environmental Policy Act (NEPA of 1969, enacted in 1970, amended in in 1975 and 1982) mandating environmental impact assessment of projects as well as public input to the decision-making process. Consequently, in the early 1900s, no studies other than that mentioned above were performed. No public input was sought, although there were numerous letters, editorials and other publications that touted one side or the other.

For participants in decision making instructional situations, Hetch-Hetchy provides an example, an almost prehistorical or pre-NEPA example, of a decision which now seems more based on which side had the 'biggest dog' in the fight, or rather which side had the most political support. Credible information, inclusiveness of stakeholders, input from indigenous people, and environmental impacts were of minor importance and apparently impacted the final decision not at all. Although the final decision may seem today to be wrong-headed, caution should be exercised when judging actions in the past using current precepts.

Case study 3: Jabiluka: [Australia, Northern Territory]. (1970 to Present).

Uranium deposits in Kakadu National Park (Australia)

were discovered in 1970 with additional discoveries in 1971. Mining started at Ranger mine within Kakadu National Park after considerable analysis that concluded there would be no significant environmental consequences of this development. The decision to develop was made with little input from the indigenous owners of the land and in the face of projected environmental consequences that were ignored but were increasingly apparent as revealed by a UNESCO World Heritage Centre review of the impact assessment process (SOC 1999). Environmental issues have continued to escalate as well as opposition by the Mirarr (indigenous Australians) to a degree that now Ranger mine is projected to close in 2021.

Development of other Jabiluka Uranium deposits are proposed to supplant the Ranger mine, but there remains much agitation among indigenous land owners as well as a mining dependent population largely concentrated in the town of Jabiru. The original decision was based on what has been called an exhaustive scientific process driven by royal commissions (highest level of investigation). The decision was supported by government which claimed there had been strong indigenous engagement. Economic empowerment was offered to indigenous people to secure support for the mining enterprise. Extensive and expensive monitoring programs were instituted. These monitoring programs ultimately found much ongoing toxic materials contamination of water and soil and formed, in part, the basis for closing the Ranger mine.

The Ranger Mine provided a short-term, "win-win", but long term issues will remain once the mine is decommissioned. Further, what will be the fate of the people and township that currently provide mining support services, once the income from the mining company is withdrawn from the region? What are the potential flow-on effects to the community in relation to life-quality, access to medical and educational support without a commercial income to leverage these benefits?

Case study 4: Zuni: [USA, New Mexico].

Zuni system of growing corn (Zea mays L.) is arguably a very strong example of a sustainable agro-ecosystem. It is a system where an ancient agriculture is based on generations of observation and implementation. This has resulted in technology that accommodates food and cultural needs of the Zuni in a matrix of clever risk management (Sandor et al., 2007). Briefly, the Zuni have developed a corn growing system that also accommodates beans and squash under the corn canopy. Fields are strategically located mostly where intermittent, rain driven flows deliver not only water to these areas but also organic material containing nitrogenous substrates originating in the undisturbed watersheds upstream. These fields produce low crop yields compared to farmed fields in the Great Plains of North America, but they do produce corn, squash and beans with no fertilization and have been doing so for 30 centuries or longer.

The salient point here is that this system closely approximates the definition of sustainable agriculture. Admittedly there are variations of the definition of sustainable and sustainability, but the core concept in most are versions of living within one's means (Benson and Craig, 2017): or more saliently defined as not expending or consuming more than can be maintained or replaced. For the Zuni, the key is using resources that are recycled or replace by natural processes sustaining over long periods their corn growing enterprise. There is an argument that this system is merely a resilient system, but equally arguable is that employing the definition above it is a highly sustainable system.

For the student of natural resource decision making, the Zuni corn system provides an example of a sustainable human endeavor. It also provides an example of an ancient technology and culture that has survived to the present despite long term efforts to stamp it out and replace it with "modern" methods.

Case Study 5: Medicine Wheel: [Wyoming, USA] (1990 to 2011).

A site sacred to regional indigenous groups is located on United States Federal Land and now is registered as a National Historic Landmark and a Native American Traditional Cultural Property. This level of preservation was achieved only after strenuous negotiations between six government agencies and 16 Native American Tribes over 20 years (Chapman, 2005).

A volume of science and cultural information was generated, collected and concentrated to address Medicine Wheel importance and preservation. The contention of the USDA Forest Service (FS) was the site, located on federal land, should be developed and made easily available to the public. This contrasted with the position of the tribes wanting preservation and only foot access by the public. Discussions became acrimonious when the FS threatened to "bulldoze Medicine Wheel" into the adjacent canyon as a response to the intractable position of the tribes (Chapman, 2005). Trust was breached by this statement and required protracted negotiation and time to bring the parties back to the negotiating table.

The Medicine Wheel controversy brings into play the issue of trust. This is a construct that is hard to acquire but often easy to lose. As such it is complex. Basically, it is a willingness of a party to be vulnerable to the actions of another party based on the expectation that the other will perform an action important to the trustor, irrespective of the ability to monitor or control that party (Chee, et al., 2017). Much of the protracted nature of the Medicine Wheel controversy was due to episodic rapid loss of trust on all sides followed by time-intensive and extensive efforts to re-establish trust.

For participants in a Natural Resource decision making curriculum or training episode, the Medicine Wheel is an example of how loss of trust and efforts to re-establish trust can protract a negotiation. It also emphasizes the need to allocate resources, often time, early in the decision-making process to build and secure trust among decision makers and stakeholders.

Case study 6: Development by Design (Mongolia).

In the late summer and early fall of 2015, the Mongolian Chapter of The Nature Conservancy sponsored, with assistance from the International Headquarters, a training

program for individuals in various Mongolian governmental agencies. These individuals had, at least as part of their positions, jurisdiction over environmental issues associated with mining in Mongolia. A training course in Restoration and Reclamation of Disturbed Lands in Mongolia was offered by one of the authors of this document (SEW), and assisted by an in-country PhD colleague: an ecosystem scientist and Mongolian native and citizen. The project was conducted through the Global Lands, Development by Design Global Priority department of the Conservancy.

There were 22 participants that represented most of the Imags (provinces) of Mongolia including three participants from the central government in Ulaanbaatar, the national capital. The actual training was conducted at a training facility located in Hustai National Park located west of Ulaanbaatar as well as at coal mines in the Gobi (desert region in southern Mongolia). These two locations were selected mainly because they provided access to field locations where soils and reclamation practices could be examined and observed in the field. In this course, there was considerable class-room instruction and discussion, but these revolved around daily field trips of 4 to 6 hours which included analysis and data collection in the field. These field trips were the central focus of the course and set the stage for final projects presented by teams of participants. However, this case study magnified the problems with not only communication across a language barrier, but also across a cultural divide.

The instructor had multiple experiences in Mongolia and had worked many times over several decades with his in-country colleague. However, the learning curve working in Mongolia has taken time, energy and fiscal resources that only multiple excursions to Mongolia (The Republic of Mongolia as well as the Chinese province of Inner Mongolia) has provided. Several principles have emerged from these experiences that are applicable to the educational process of land management decision makers. First is that building trust is an essential first step. In Mongolian culture, consumption of alcohol is an essential catalyst towards trust building. Being willing to sing in a public manner is also essential as well as playing games. A basketball game in Hohhot, Inner Mongolia between USA students plus instructors against Mongolian students plus instructors seemed to solidify relations between the two cultures more than any number, intensity, or duration of classroom lectures or discussions. The game was played outdoors and on a dirt court where everyone, female and male alike, became essentially one dirt and perspiration covered race, thereby served to bring two very different ethnicities together as no other action did, especially when the game was declared a draw by both sides.

Other principles emerging over the years in Mongolia were essential components leading to some success in the disturbed lands training. Much of this was in the realm of role reversal including that the instructor learns more from the attendees than visa-versa. Further is that cultures have so many similarities—many more than differences. Focusing on the similarities is essential. Recognizing, playing with and honoring children, for example, goes to the heart of our similarities. Among other principles is that to really immerse in a culture requires learning the language and making a long-term pursuit of embracing the culture. Even then, when tall, bearded, bald and white, one never really becomes unified with the Mongolian Culture. Thus, cultural awareness is an essential component of any training or curriculum that attempts to address education of decision makers in the natural resource realm.

Case Study 7: Mimbres [New Mexico, USA] (circa 1000 CE to 1150 BCE).

The Mimbres are representative of numerous prehistoric culture sites throughout western and southwestern North America. The study sites investigated by Sandor and others (1986a, b and c) are located along valley margins within a semi-arid mountainous region of southwestern New Mexico. Here agriculture terraces were constructed by placing small rock dams across gentle slopes to slow runoff and direct water onto fields. Sedimentation upslope of these dams created terraces as well as increased the depth of the surface horizons of the soils which were farmed.

In the current southwest USA, the pre-contact botanic evidence indicates that corn (Zea mays L.) was the principle crop, along with squash and beans. These crops were grown on the Mimbres runoff agricultural sites during the period of about 1000 AD until 1150 AD. Fields were abandoned sometime thereafter. Now the Mimbres culture has disappeared and is assumed to be extinct. It is possible that they moved from their mountain valley and interfaced and perhaps coalesced with other people. Despite their disappearance, the marks of their civilization are still apparent in the soils of the Sapillo Creek drainage in New Mexico today. Even more telling is comparison of soils between cultivated and un-cultivated sites in the Mimbres area. The control sites (uncultivated) have significantly more organic carbon, total nitrogen, total phosphorus and acid extractable copper in the upper part of the A (surface) horizon, in the overall A horizon and in the B (sub-surface) horizon as compared to the cultivated sites. Evidence also shows that cultivated soils are more compacted than the controls. This investigation shows significant, degradative changes in soil properties following prehistoric cultivation have persisted for nearly 1000 years after cultivation ceased.

The fate of the Mimbres people is not known. However, evidence suggests their farming practices resulted in degraded soils. These factors would create a farming environment that was less productive and took more physical and energy resources to farm. These factors alone may not have been the cause of the demise of this culture, but this is environmental degradation, which is one of five named reasons (Diamond, 2005) that societies collapse.

For the student of the decision-making scenario, the disappearance of the Mimbres is a reminder that societal decisions and methods (here degradative farming methods), can leave long term ecosystem marks, but can also have dire societal consequences.

Case study 8: Cascade Regional Park [North Island of New Zealand, 1972-present]

The Kauri Agathis australis forests of northern New

Zealand represent an iconic species threatened by over-utilization, fragmentation and invasion of a non-native plant pathogen. The Cascades Regional Park was farmed, and partially cleared, until the owner donated the land (160 square km) to the Auckland Regional Council. The Central governance designated the area as a 'Regional' park-under a federal act of parliament. No science, economic or cultural analyses were undertaken as part of the decision-making process, as this was purely a conservation imperative from the benevolent benefactor. Co-governance is by a Maori sub-tribe and a region governmental authority. Considerable tension exists between the indigenous Maori (wanting to maintain cultural values) and the public who desire recreational access. This is due to phytosanitary restrictions associated with the management of contaminated soil movements e.g. on shoes of visitors. In 2018, the local mana whenua (local tribal authority) declared a cultural quarantine over the park, which restricted public access to the park, but still permitted access to research and pest-management concessionaires.

The point of contention in Cascade was and is that an apparently exotic pathogen, a Phytophthora sp, had moved into or was activated in Cascade that was killing the iconic kauri forests. Kauri, Agathis australis, is very important culturally to the indigenous people of New Zealand as well as important aesthetically and economically to all New Zealand.

Under the banner of "Unlocking a Nation of Curious Minds", co-created with two primary schools was the research endeavor entitled "Fishing for Phytophthora: stream-based surveillance for exotic Phytophthora threats" (Bellgard et al. 2017). Posed to the students was the challenge of developing a sampling device for surveying and monitoring streams for Phytophthora species. Together the students used a Student's Computer Aided Design (CAD) package to design a bait cassette which they extruded on a 3D printer. These were placed in streams and after incubation were processed at the laboratory of the Manaaki Whenua (Landcare Research Tamaki Campus). The students sub-cultured the organisms that had grown out from the bait pieces. Morphology and various stages of the life cycle were examined using selective media and light microscopy.

For the natural resource decision maker apprentice, Cascade provides an example of new information that has substantial management implications. In this case, new information has resulted in closing of the park to protect the Kauri, and the Department of Conservation has now also closed several conservation walking tracks through other Kauri forests. The Cascade situation illustrates how in this case microscopic organisms can have substantial ecological impacts. Unanticipated and often highly unpredictable events (e.g. flood, drought, earthquake, pathogenic microbes, invasive plants, invasive animals, etc.) can have intractable, often rapid impacts. This situation also demonstrates how a new generation of decision makers can be incorporated into the monitoring of an incursion, especially, in the current situation where the mechanisms controlling landscape movement of soil-borne plant pathogens are not well understood.

Case study 9: Modern Wyoming

Modern Wyoming of the United States represents a microcosm of global nostalgia and utopia (Giesecke and Jacobs, 2012). Wyoming is a political entity that bridges the Southern and the Northern Rocky Mountains as well as bridging, east to west, the northern mixed grass prairie across the Great Divide to the Basin and Range region. It encompasses just short of 250,000 square kilometers (100,000 square miles) of map surface area. Nearly half (49%) of the land of Wyoming is public land managed either federally or by the State of Wyoming. These lands include large national forests, several noteworthy national parks, State of Wyoming Holdings that constitute around 5% of public lands (Including State Parks), and a very large holding "of the lands nobody wanted (Allen, 2002; Muhn and Stuart, 1988)," now managed by the federal Bureau of Land Management. The rest is privately owned with the clear majority in diverse ecological systems often lumped together as rangelands. There are some private forests, and a million hectares (about 2.5 million acres) of rain fed and irrigated farm land.

When Wyoming became a state (1886), the human population was very low (less than 100,000). The economy was almost exclusively cattle ranching. Tourism was slowly coming of age. Since then energy production has slowly, with occasional bursts of velocity, become the dominant economic driver of the state: gas and oil, coal and uranium. Uranium production has fallen off, as well as more recently the coal industry. Wind driven energy continues to develop, but likely will not supplant the economic position of either uranium or coal.

In 2008, the state geologist announced in a widely-publicized document that Wyoming was in an energy boom with no forecast end. "Instead of worrying about a bust that will not materialize anytime in the near future, Wyoming should plan for sustained prosperity (Surdam, 2008, page 6)." This turned out to be the harbinger of a down turn in the coal industry and the cessation of the uranium industry. Even in the days when coal and other energy extractive industries provided the state with considerable severance-based tax resources, there was talk about developing uses for coal other than unmitigated combustion. This was perhaps motivated by desires to find additional markets for coal generated products rather than as a hedge against when coal as a fuel would no longer be environmentally and thus economically feasible. Ideas ranged from using coal in some form to pave highways, to coal liquefaction for use in combustion engines, to gasification for use in furnaces and stoves. However, there was a pervasive attitude that coal as a fuel would never end and the state could run in perpetuity on coal as a fuel source. Now with the end of fuel coal crystalizing, there is a return to conversation about what else could be done with coal.

This final case study is not meant to be an indictment of Wyoming, how it is marketed or the basics of its economy. Wyoming is, rather, an example of how most human societies operate. It is "a microcosm of the macrocosm". It is an example of how one political entity has addressed the nexus of food-water-energy needs and formed fundamental

strategies to maintain social security and harmonious co-existence. There is a strong tendency for humans to look back at a time in the past when times were good and uphold that as a standard for the future. There is a tendency towards nostalgic reminiscing as certain demographics ignore validated and certified harbingers of the future (e.g. climate disruption: Bellgard and Williams, 2011; Dawson, 2017; Furniss et al., 2010; IPCC, 2019; Nanus et al., 2005; US Congress, House Committee on Natural Resources, 2019; and many others), and cling to ideals and constructs that have worked in the past. This is not unique to Wyoming. It is a nation-wide, and indeed a world-wide theme. Natural resource managers should realize that this tendency drives much decision making and is not necessarily wrong-headed (Schneekloth, 2012). Still, is such a desired return to the past a logic to honorably and fairly revive a sagging society or rather to protect a dying, outmoded enterprise.

Discussion

Teaching about complex environmental and social issues requires a choice of varied teaching methods adapted to the audience, to the learning objectives and to content. These can include, but are not limited to: case studies, mini-projects, informal and formal presentations, debates, panel discussions, practical work sessions, workshops, role-play, simulations, and visits to study-site (e.g. Zurita et al. 2007). Ultimately all is focused on developing skill sets that students will draw from as they enter the world of natural resource management outside of formal instructional settings. Herein we have developed from case studies a tabulation of skills that current and new generations of natural resource managers will need (Table 1). At another level, the case studies we have chosen represents a microcosm of the challenges that face the world's economies as they balance the nexus between energy, water and food security (Beddington 2009). The long-term impacts associated with climate disruption, environmental and habitat degradation, demise of a key trading partner or activation of a conquering enemy may result in collapse of a society. Other causes of collapse can arise from political leaders or society making ill-conceived decisions. History is fraught with such examples (Diamond, 2005). Various policies (often codified as rules and laws) and end-users frequently prescribe that specific elements be used to make decisions sometimes in short time-frames. Circumstances aside, natural resource management decision making should be supported by the best available certified information and analysis (Table 1, item 1a). Further, legitimate stake-holders (those with economic, aesthetic, ethical and/or cultural ties to a decision (Table 1, item 3b)) often demand to have their voices heard. Such groups can have conflicts of interest compromising credibility. Others may have interests that clash with closely held beliefs of those who render final decisions. There is no formula or set of skills that can guarantee a successful decision in such cases. Best recommendation is to place biases and closely held beliefs to the side and attend to best available information and with a mind towards future generations of humans and ecosystems.

Ultimately success of the decision-making cycle (see examples in Bunnefeld et al., 2017, pages 8-12) relies strongly on trust (Table 1, item 5a) in the decision makers and trust in the process. Although trust encompasses a range of factors, these summarize into several basics: propensity to trust and perceived ability, integrity, reliability and benevolence of not only the decision makers but also the decision process (Chee et al., 2017, 75-76). Inserting experiences, such as the case studies described herein, into curricula in general or into shorter training courses is challenging to instructors but the content is exactly what students of natural resources management decision making need. This rings true especially when such experiences come directly and hands-on from the court room, the committee chamber, the open pit mine, the eroded rangelands, the recently burned forest and perhaps the unintentionally-desecrated or scared sacred site. All of these we contend make up the multiplicity, and intricate, culturally-enriched, tapestry of the "real world" or the field-laboratory in which future environmental leaders will need to engage with, on a day-to-day basis.

Ultimately the goal of educating natural resource managers is to assure as much as possible that as trained and experienced professionals they engage in making durable, inclusive, just decisions that anticipate and weigh negative consequences with desired outcomes. In the short-term decision makers may have to address critically-urgent issues while delaying decisions on others. In the final analysis, however, decision makers must not forego the responsibility to address the long-term, intractable challenges of social-health, education and security-issues that may need generational time-scales to resolve.

We have grouped the extracted 21 skills (Table 1) from the nine cases studies presented above into seven sets of skills and given general names to these sets. There is overlap between sets as is apparent in that some of the specific skills appear in more than one set. The skill sets and the specific skill identifications (see Table 1) are:

1. Trust Building ability [5a, 8c].
2. Information generation and screening capacity [1a, 1b, 1c, 4a, 6a, 8a, 8b].
3. Cultural awareness including contrasting world views [3a, 41, 6b, 8c, 9a, 9b]
4. Use of instructional and decision making environments [6c and others]
5. Awareness and incorporation of land ethics [3a,8d]
6. Historical and political knowledge (legal) [2a, 2b, 7a, 8b]
7. Awareness and use of the decision-making process [1c, 7a, 7b, 8c, 8d, 8e, 9a]

From these skill sets a general protocol for decision making can be derived. Trust must first be established or at least strongly considered by the decision makers. As hearings for a decision are being conducted, an aim is to strengthen trust. The decision-making scenario then can be entered at either the information, cultural, ethics or legal levels, which ever seems most logical. Some likely will not need to be addressed in certain decision situations, but all should be at least in the minds of the decision makers.

Table 1. Case studies and skills derived. These form a skill set needed by current and future natural resource managers.

Case study	Description	Featured Skill(s) derived or implied
1	Biosecurity New Zealand: Cultural and Scientific Exchange	1a: Defining, recognizing, acquiring and using best available information. 1b: Recognition that information can be often generated or acquired rapidly. 1c: Recognition that credentialing of information and decision making processes are slow.
2	Hetch-Hetchy USA, California: Dam and Reservoir Construction	2a: Many natural resource management decisions were made in the past in the absence of rules and regulations. Historical knowledge of situation is essential. 2b: Care should be taken when judging natural resource management decisions of the past using current knowledge as well as rules and regulations.
3	Jabiluka, Australia Northern Territory. Uranium mining	3a: Decisions that create a short term benefit apparently for all constituencies may have long term negative impacts as unanticipated consequences! 3b: Engagement of indigenous people in the decision making process is crucial and requires understanding of culture, rational for opinions and respect.
4	Zuni, USA, New Mexico	4a: Tried and true methods developed over a long period of time should not be ignored or discarded just because they are old or even ancient.
5	Medicine Wheel, USA, Wyoming	5a: Trust among all parties involved in a natural resource management decision is often the most important construct in reaching enduring resolutions.
6	Development by design, Mongolia	6a: As instructors or instructed, both group should recognize information flows from both. 6b: Natural resource management in situations where there is no common language requires not only full knowledge of cultural imperatives of all, but also use of interpreters knowledgeable of technical aspects of the issue or, better yet, all participants learning the language of the others. 6c: There is no substitute for field learning environments where all can interface with the natural environment. The best of video presentations or most brilliant of lectures are not equivalent to the interface with the natural world, although they can help to solidify concepts and summarize.
7	Mimbres, USA, New Mexico	7a: Poor natural resource management decisions can leave landscape marks that persist long into the future. These can be benign but also detrimental. 7b: Such decisions, especially those often made with no evaluation of potential negative impacts, can have substantial social and ecosystem impacts.
8	Cascade Regional Park, North Island of New Zealand	8a: Information needed for input to natural resource management decisions needs to cover many scales from atmospheric to molecular and including terrestrial and aquatic as well as macro to microorganisms. 8b: Effective natural resource managers must be well versed in their field of expertise but should recognize they do not know everything and thus bring other key experts to the decision making process. 8c: The decision making process can be enhanced (and trust engendered) by involving a diversity of age and cultural groups in discovering or providing information including research to legitimize and finalize the decision. 8d: Not all decisions will result in the greatest good for the greatest number. Some are made to protect the unique or endangered that are threatened by any human interference. Such decision can be very unpopular. 8e: Unpredictable events (flood, earthquake, volcanic eruption etc.) can have impacts that preclude or make irrelevant decisions or the decision making.
9	Modern Wyoming, USA	9a: Natural resource managers should realize that people have different world views and thus have often very different utopias (ideas of what constitutes a perfect world). Accommodating varying utopias in a natural resource management scenario is a major challenge in the decision process. 9b: Utopias are the result, often, of nostalgias. Nostalgias are centered on wistful affection for the past. The basis for a nostalgic cover may be sentimental, financial or fear of an unknown future.

The socio-economic, cultural, and political environment under which the decision is made, is as consequential as the physical environment under which the trained natural resource managers acquired their full range of skills. Some decisions are made in courts of law where traditionally a jury is empaneled, an audience is seated, lawyers present perspectives and a judge renders a consensual decision based (often) on a finding from the jury. There is an argument that if decision making reaches the level of a courtroom environment, that is a signal that at one or more levels, there has been a break-down in the negotiating process resulting in failure to achieve consensus. Further, if a decision reaches the courtroom, the probability is low of reaching a durable, inclusive, just decision that anticipates and weighs negative consequences with desired outcomes. Although the environment for decision making is often constrained by logistics and resources, there may be good logic for at least conducting part of the hearing out of doors at the site that maybe the center of contention. If a hearing has to be conducted strictly in say a hearing chamber, good ventilation, superior visual and audio technology, availability of restrooms, taking of periodic breaks, etc. are all essential. To some, these environmental factors may seem trivial. But, it will be difficult to secure a durable, inclusive, just decision when the decision makers, observers and presenters have been too long in a hot room, on hard seats and bedeviled by full bladders. There may be an economic argument against securing a proper environment for the decision making. The economic argument should also weigh in the possibility of a poor decision or even no decision. Case in point, case study 5: Medicine Wheel.

The first step, therefore, in decision making is building trust (Table 1, item 5a again). In a curriculum that addresses decision making, placing trust building mechanism at the highest level of priority in the list of topics to be examined and experienced is paramount to not only the success of the decision-making process but also in the success of students in learning about and experiencing the process. A crucial component of trust is credibility of input to the decision-making process. Criteria for determining input credibility include validity measures of science and economic studies (e.g. data cleaning and transformation, information extraction and interpretation, statistical validity, and degree of professional peer-review); input on aesthetic and ethical characteristics (e.g. level and volume); ecosystem characteristics and services (e.g. characteristics free from anthropomorphic bias and anticipated ecosystem services); traditional historical information pertaining to the decision (from persons usually having long-term observations and perspective in a given ecosystem); and cultural considerations (usually by indigenous individuals or groups and may have spiritual, sense of place and even esoteric, but at least important to them, ecosystem connections). This work highlights several case studies of land management decisions and the information and analysis used in those decision cases. However, the principle focus of this treatment is emphasis on training of individuals in the decision-making process. This includes seeking and using best, scientifically-validated, information (Table 1, item 1a), but also structuring the decision-making process to be inclusive, to accommodate cultural and social imperatives as well as time-lines that are governed by the integrity of the process rather than some arbitrary temporal scale of "10 working days". When interacting with First Nations, temporal necessities should be negotiated in terms of the "tikanga" (ritual process) associated with the deliberations. Demonstration of empathy for these cultural subtleties is a quantum step towards engendering cross-cultural trust in the decision makers and the decision-making process, and exhibits "cultural competency".

The 21 skills list (Table 1) is undoubtedly incomplete and certainly many of the skills listed overlap with others listed. Some of these skills are in the form of recognitions, e.g. that the decision-making process is slow (Table 1, item 1c). In an instructive setting, it is not really possible to merely tell students that the process is slow. Examples need to be given and, better yet, take the students "to the field" where a decision making is in progress. A meeting of an environmental quality council mandated with deciding on building a road through pristine park land used by hikers, hunters of mushrooms and photographers adjacent to a metropolitan area, is usually open to the public. Taking students to such a meeting or assigning a set of students to attend and report back to the class, informs learners as well as instructors in a salient knowledge-sharing manner. In the authors' experiences, there is no reason why students cannot be exposed to if not involved in the actual decision making process of natural resource management. The more interactive and participatory the process, the greater the student's concentration and the easier fundamental and abstract principles are acquired and within a real-life, pragmatic framework. The project "Engaging a Nation of Curious Minds," from case study 8 (see table 1, item 8c) also demonstrates to students how time consuming and often difficult finding credible, here research results, can be.

A positive relationship between students and teachers can develop during a mutual learning process using a peer-to-peer approach. The aim is to reduce the disparity between the teacher and pupil. The students are empowered to co-create the foci, and thus, they take greater control of their own learning by participating in the planning and implementation of best available information-based projects, while benefiting from the experience and (hopefully) zeal provided by their instructors. Knowledge transfer and exchange is an interactive interchange of knowledge between end-users and producers (Kiefer et al. 2005). The primary purpose of knowledge exchange is to facilitate the uptake and utilization of evidence into policy decision making and to ultimately change behavioral norms to improve the quality of life and the livelihoods of the constituency (Mitton et al. 2007). Assessment of knowledge transfer and exchange is undertaken via a variety of means. These range from pre-activity survey forms and post-activity survey forms, to assessing the change in awareness about the specific aim or objective of the instructional activity. Another more formal form of assessment involves students presenting project proposals to a panel of assessors (which may include students), and then critically examining the aims and objectives, hypotheses to be tested, experimental design, and predictions about the outcomes. These mini-

projects or special projects can be written up by the student participants and formally assessed as part of curricula.

At the most fundamental level, we propose a change in the way natural resource decisions are made. Fundamental to this premise is that the training of natural resource managers must change. The administration of USA President Theodore Roosevelt (1901 to 1909) was marked by decision making that resulted in long term programs resulting in protection of natural resources. Natural resource management was characterized by the wanton exploitation especially during, but not limited to, the 1800s (Udall, 1963). However, the decision-making process from then until now has been one borne of mis-trust and characterized by confrontation, rulemaking and citation driven enforcement (e.g. case studies 2, 3, 5 and 8). It is well known that "environmental problems have physical, psychological, social, ethical and philosophical components (Ault, 1994, p. 148)." It is no stretch that environmental solutions, and thus the decision making process, should also encompass these components. We contend, therefore, that the natural resource decision making process must engender trust, be collaborative, made considering multiple facets of the issue and not be entirely rule driven but rather driven by reason. We realize that many of these components at a general level are ambiguous. However, they must be addressed if decision are to be just and sustainable.

In conclusion, the necessary considerations to achieve sustainable, consensual decision making to support global and resilient natural resource management include (but are not limited to): scientific and social studies, economic imperatives, aesthetic considerations, ethical and legal considerations, cross-cultural values, and political agendas and ideologies. These impact the future of global natural resource management to achieve food, water and energy security in the face of climatic disruption, and the expanding global population. The tools necessary to address such urgent challenges lie in the creative minds of students across the globe. Activity-based teaching helps students achieve learning objectives especially when applied to complex, trans-disciplinary challenges, and the evaluation of management interventions. The skill sets needed for natural resource managers go beyond the basics of; reading, writing, talking, thinking, explaining, negotiating, applying, testing, and synthesizing diverse information sources. Embracing the cultural and societal diversity which exists within their peer-groups, teachers, mentors and broader community, is an essential core-skill which will pre-adapt them for the real-world challenges that face natural resource decision making at the local-, regional- and global scales. These decisions have consequences for us all as engaged members of the global community.

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If Pictures Could Talk: Using Photo Novella in International Service Learning to Capture Visual Meaning and Interpretive Engagement

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Abstract

Many complex problems require interdisciplinary solutions; however, students are often trained to work in specific areas and may not be able to make connections in a diverse international context. Four graduate students participated in a 2-week global horticulture, human nutrition, and community resilience project in Timor-Leste and provided one photograph each accompanied by a written reflection about their service-learning experience. Learners demonstrated how concrete experience, reflective observation, abstract conceptualization, and active experimentation contributed to their understanding of international development based on their service experiences in the Timor-Leste villages. Students engaged in action learning/research in local communities develop professionally and personally, and photo novella is an effective research and evaluation technique for demonstrating the iterative process of actions and reflection for global learning experiences.

Introduction and Background

High-impact learning experiences provide students with rich environments for engagement and growth both professionally and personally (Homeyer et al., 2017). Kuh (2008) provided insight into how high-impact practices can increase student retention and engagement. One such activity is service-learning, where students apply what they are learning in real-world settings and reflect on their service experiences (Kuh, 2008). Service-learning is a community engagement pedagogy within experiential education, where learning occurs through a cycle of action and reflection (Eyler, 2002). The context of a service-learning project in an international setting adds another dimension of global competence that is relevant for working in complex, multinational settings. This falls into the constructivism learning theory, suggesting that learning does not occur in isolation; rather, it is a social process that includes an iterative relationship between learners, instructors, and the local community (Ash and Clayton, 2009). Community-based problem solving and research can foster "deepening civic and social responsibility…, collective civic problem

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solving, global learning focused on real-world challenges…, and […] collaborative, generative partnerships that teach students how systems work and can be changed" (AAC&U, n.d., para. 4). Coupling service-learning with an experiential education paradigm actively engages the student in the phenomenon they studied in a classroom and allows the student to develop critical thinking and interpersonal, cultural skills in an intensive setting (Montrose, 2002).

Educators require innovative evaluation techniques to accurately understand these global learning experiences. Photo novella, based in problem-posing and empowerment education (Wang and Burris, 1994), provided the methodological framework for this study. According to Wang and Burris (1994), the goal of photo novella is using "people's photographic documentation of their everyday lives as an educational tool to record and to reflect their needs, promote dialogue, encourage action, and inform policy" (p. 171-172). This method has the potential for the development of intercultural competency through insights about lived experiences and for diversified communication through understanding the signs and meanings that are significant to a different culture (Borron, 2013; Bost and Wingenbach, 2018; Roberts and Edwards, 2016). Through photo novella, participants tell a story through photographs to communicate their story and assist in understanding (Wang and Burris, 1997). Through photo novella, researchers gain insight into the group of participants who completed the experience as a cohort. Participants' selections and descriptions of representative images of their experiences provided a visual component that enhanced the evaluation of the project.

Complex problems often require interdisciplinary approaches to develop potential solutions. However, traditional approaches in graduate education typically focus on the depth of knowledge in one discipline, primarily through formal coursework and laboratory settings. A premise for this research is that action learning and research provides a framework to examine complex experiences. Action learning is operationalized as "learning from action or concrete experience, as well as taking action as a result of this learning" (Zuber-Skerritt, 2001, p. 2). Action research builds upon this concept as "a cyclical iterative process of action and reflection on and in action" (Zuber-Skerritt, 2001, p. 2). The concept of action learning and research guided the creation and implementation of the international service-learning experience explored for this study.

Research has shown that agricultural education students and other students in colleges of agriculture lack knowledge of international agricultural policies, practices, products, and cultures (Morgan and King, 2013). In an increasingly globalized agricultural sector, it is important for students to develop intercultural competencies to assist with the complex problems that arise. Another important reason for immersing students in cross-cultural experiences is to correct the often-inaccurate representation of minority and underserved groups that have traditionally characterized research and scholarship in academia (Geron, 2002). Academia must continually evaluate what it means for students to be globally and culturally competent, and international educational experiences are an impactful method to increase students' civic engagement and intercultural competency (Murphey et al., 2014). Coupling service-learning with an experience like international service-learning (ISL) provides students opportunities to relate academic materials received in the classroom to their service activities in-country, as demonstrated by Black et al. (2013). Black and colleagues (2013) found that students formed five major themes from their experience: adaptation, culture, collaboration, communication, and the value of knowledge, which are all valuable intercultural concepts in graduate education.

The ISL in this study was designed as a highly intensive assignment in which students worked with local stakeholders to develop solutions to the dynamic challenges facing farmers in different communities in Timor-Leste, an impoverished country in southeastern Asia. Prior to engaging in the ISL experience in Timor-Leste, students were enrolled in a graduate-level, interdisciplinary course, Global Horticulture and Human Nutrition to Enhance Community Resilience and Food Security. The concepts learned in this course, such as food security, sustainable international development, child and maternal nutrition, and tropical horticulture were presented to the students viscerally while in Timor-Leste. While in-country, students were encouraged to collaborate with small-scale farmers to solve issues with their crops as well as provide nutrition trainings to members of several communities. Photo novella allowed students to reflect on their learning experience abroad. The incorporation of photographs into the research process allowed students to more deeply engage with community members from the social interactions involved in photography, including showing participants' photographs as well as analyzing the photograph after the interaction (Gold, 2004).

Service-learning research faces a methodological crossroad, so there is a need to develop rigorous research methods to better understand, improve, and substantiate the value of service-learning in higher education (Kiely, 2005; Ziegert and McGoldrick, 2004). The researchers explored the potential for photo novella as a novel reflection technique that allows students to extract the most from their international service-learning (ISL) experience. Because ISL is "more arduous, time-consuming, and pedagogically complex than most curricular methods" (Kahn, 2011, p. 113), exploring new methods of reflection can enhance the student experience in-country and allow educators insight and new perspectives on that experience.

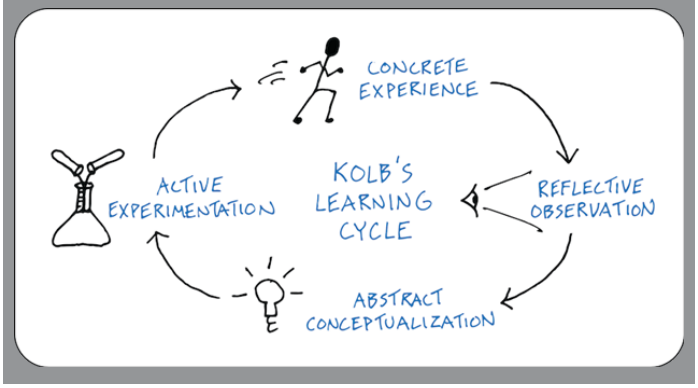
Theoretical Framework

Experiential education and learning are key mechanisms for agricultural education and communication curricula (Swenson et al., 2018). Kolb's Experiential Learning Cycle reflects the idea that "learning is the process whereby knowledge is created through the transformation of experience" (Kolb, 1984, p. 38). This seminal theory holistically describes learning as a process of human adaptation driven by the resolution between action/reflection and experience/abstraction (Kolb and Kolb, 2012). Kolb

(1984) believed that learning moves through four stages: (a) concrete experience, (b) reflective observation, (c) abstract conceptualization, and (d) active experimentation. Concrete experience (CE) includes the active experience of the learner, including laboratory or fieldwork (Kolb, 1984). Reflective observation (RO) includes the learner's conscious reflection of the experience. Abstract conceptualization (AC) encompasses the learner visualizing a theory based on what they observed during the experience. Finally, active experimentation (AE) is when the learner applies the theory or what they have learned for a future experience (Kolb, 1984). These stages occur cyclically—in order to transform their experience into learning, students must begin with a concrete experience, reflect on their observations of that experience, comprehend this experience through abstract conceptualization, and finally actively experiment with concepts generated by the experience (Kolb, 1984; Lutterman-Aguilar and Gingerich, 2002) (see Figure 1).

Kiely (2005) stated that service-learning research should "identify the learning processes that explain how service-learning is uniquely transformative" (Kiely, 2005, p. 17). Due to the complex pedagogy and setting of an ISL experience, Kolb's (1984) model was selected as the analytical framework for this study. This model allows researchers to identify specific and transformative aspects of the experience and relate them to Kolb's experiential learning cycle.

Figure 1. Kolb's Experiential Learning Cycle. Credit Sketchnoting for Experiential Leaners – Verbal to Visual. https://www.verbaltovisual.com/wp



Purpose and Research Objectives

The purpose of this study was to analyze the iterative process of action and reflection on graduate students who participated in an international service-learning project using Kolb's (1984) experiential learning model for theoretical triangulation. The research objectives that guided the study were to (a) describe visual meaning and interpretive engagement from student narratives and photographs and (b) determine student experiences through the triangulation of Kolb's model and the photo novella technique.

Methods

The qualitative research design (Patton, 2002) that guided this study allowed for a novel method for analyzing photo narratives (Bost and Wingenbach, 2018; Homeyer et al., 2017). This study used participant-generated photographs and narratives in the action research paradigm. Four graduate students, all of whom were enrolled in the course Global Horticulture and Human Nutrition to Enhance Community Resilience and Food Security (NEXUS), participated in a two-week community resilience project in Timor-Leste. The graduate students had backgrounds in horticultural sciences, agricultural education, and public policy. Two of the graduate students had recently finished their undergraduate programs and were at the beginning of their master's degree program. One of those had no prior experience in international development (Student 1) and the other had participated in an international service-learning project previously through their university (Student 2). One student had recently completed a master's degree in public policy and had worked as a peace corps volunteer (Student 3). The fourth student had experience as a teacher and with international development (Student 4). This purposive sample of ISL participants was selected from applicants from the online NEXUS course offered during the spring 2018 semester. The participating graduate students had similar foundational knowledge, but much variation in experience with international development. Prior to embarking on the trip, students participated in a two-day orientation about Timor-Leste and the expectations of a service-learning project, as well as the USAID-sponsored project, Avansa Agrikultura, with whom they would interact in country.

Students provided one image and a written reflection about a photograph that best depicted their service-learning experience for their photo narratives (Drew and Guillemin, 2014). The inclusion of the narrative stems from Banks' (2008) rigorous approach to interpret meaning through the addition of an internal narrative that the image communicates. Yates (2010) further described this method as a critical, participatory/action research tool to access the perspectives of the participants, to understand the production of certain images, and to discover the associated meanings of images for participants. This ensures that the voice and perspective in analysis and reporting are interpreted more effectively (Piper and Frankham, 2007). Transformative, reflective learning experiences that intend to challenge students' current perspectives and understandings (Rice et al., 2014) are important tools for service-learning evaluation, and the inclusion of photographs allows researchers richer insight into the students' experiences. This combination of photo and narrative analysis brings richness and thick description to the visual interpretation and meaning-making. The researchers engaged in the participatory process through participant observation, and the students represented their participatory experience through this photo narrative method.

Drew and Guillemin (2014) described a process called interpretive engagement that guided the data collection and analysis of this research. This approach has three stages: (a) participant engagement, (b) researcher engagement, and (c) re-contextualizing. In the first stage, an image is collected from a participant, along with a reflection on their image within the context of production. Stage two involves a close examination of the images and their explanations. Two researchers, who evaluated the field experience, independently reviewed the photos and narratives. The researchers then generated themes based upon emergent concepts from the narratives. Stage three of the interpretive engagement framework is re-contextualization. Similar to triangulation (Lincoln and Guba, 1985), interpretations were analyzed through Kolb's Experiential Learning Theory (1984). The researchers, after independent review, reconvened and dually analyzed passages that reflected Kolb's theory. Researchers read the passages line-by-line, consulted on definitions, and indicated excerpts that reflected the theoretical stages in each photo novella.

Other studies utilizing photographic methods have implemented qualitative and mixed-method content analysis (Bost and Wingenbach, 2018; Homeyer et al., 2017), resulting in emerging themes. This study connected narratives to Kolb's Experiential Learning Cycle in a novel way, by presenting data in the participant's own words and superimposing researcher categorization within the narrative. In this way, the context necessary for understanding the narrative is not lost, as sometimes occurs with using excerpts in data reporting.

Context For the Study

The Democratic Republic of Timor-Leste became independent in 2002. The median age is 18 years old with one in six children under the age of five being malnourished. Close to 60% of children are stunted, with infant mortality at 48% (Hughes, 2015). Some factors that contribute to malnutrition include a lack of dietary diversity, inadequate sanitation and hygiene, and a lack of clean water. Hamutuk Ita Ajuda Malu (HIAM) means "together we help each other" in Tetum, the native language of Timor-Leste. HIAM Health was the agency that provided access for the graduate students to work directly with village farmers.

Two researchers engaged in participant observation with students during the following activities. The first service-learning experience was in the Aileu district. The group worked in the Rairema sub-village facilitating training programs on basic food groups, personal hygiene, and pest control. The next community in the district was Suco Fahiria where they observed and participated in a training program with farmer groups. The second service-learning experience was in the Maliana district. The students participated directly in fieldwork in the Barut Mean community establishing garden beds, observing farming systems, and interacting with the local children. The last day was in the Fatubesi community where they were able to observe and assist in a participatory community needs assessment. All in-country experiences provided learning and meaning-making opportunities that expanded upon concepts learned in the course during the spring semester of 2018.

Results

Each of the four participating students constructed one narrative based on a photograph they had taken during their time in Timor-Leste. The researchers preserved each student's voice in each narrative and only altered wording where clarification was needed. In each passage, two researchers identified aspects of Kolb's experiential learning cycle with a representative code (abstract conceptualization = AC, active experimentation = AE, concrete experience = CE, and reflective observation = RO). These researchers co-evaluated the narratives with a discussion of each statement and agreement on which stage was represented. Hybridizing the dissemination technique of crafted profiles (Seidman, 2013), in which researchers and participants craft a narrative, the results of the study include participants' narratives with researcher-superimposed codes stages of Kolb's theory. While Seidman (2013) applied this technique with interview data, the researchers hybridized this technique for results dissemination for photo novella.

Full Excerpts from Participant Journal Reflections with their Selected Photograph

Student journal reflections along with the image they selected focused on the following four themes that were based on visual meaning: 1) resilience, 2) learning from locals, 3) international development challenges, and 4) local engagement for a sustainable future.

Student 1

Timor-Leste gained independence in 2002. But this small country's history does not begin with its independence. For 450 years, the Portuguese colonized the island, which changed the native religion to Roman Catholic, the native language to Portuguese and the culture to abide by Portuguese customs. After the Portuguese left, Indonesia occupied Timor-Leste for 24 years. During this time, countless people were slaughtered and led into starvation. Video footage of a massacre finally caught the attention of powerful leaders such as the U.S. President, who called for action on relieving Indonesian power over the Timorese. Presently, the issues the Timorese people are facing lie in poverty, malnutrition, sanitation, and lack of education. Many non-government organizations (NGOs) and other aid organizations have gone to Timor-Leste and are trying to address the issues these people are facing. Even with the amount of help available, it is difficult to obtain resources for a country that is very isolated. The people of Timor-Leste never give up and keep pushing forward even with the astounding amount of problems and tragedies. They have learned to forgive those who have wronged them and have reconnected with their native language and customs. Each morning, men, women, and children all rise to begin a new day working to better their livelihood. The local NGOs and other aid groups would not be able to make an impact if it weren't for the sheer determination of the people to change their way of life. As a new day begins, the people of Timor-

Leste look for a way to better themselves from yesterday and as the day wanes, they look to what they can better for tomorrow (RO). The people of Timor-Leste are the definition of resilience (AC).

Figure 2. Visual meaning of resilience

Student 2

Throughout my life I have heard the saying, 'Age is just a number' repeatedly. However, it wasn't until my experience in Timor-Leste that this meant something to me. The young boy in this photograph was my teacher, guide, and friend for the day. When we ran through the terraced rice fields overlooking his community, I did not view him as younger or less experienced than me. He taught me about navigating the complex agriculture fields that were used to feed and financially support his community (CE). The time I spent with him and his family was the epitome of this service-learning experience in Timor-Leste. In the words of the National Service Learning Clearinghouse, service-learning is 'a teaching and learning strategy that integrates meaningful community service with instruction and reflection to enrich the learning experience, teach civic responsibility, and strengthen communities.' For me, my interaction with this boy was a perfect summation of how this trip embodied what it means to complete a service-learning experience (AC). Our team helped to teach nutrition and hygiene workshops in the community where this photo was taken. The workshops were our way of empowering the community with knowledge to improve their lives through health and wellness […]. The interactions we shared with the community was not a one-way street (RO). In return, the community taught me about their farming practices and explained how they partner with local non-governmental organizations to provide nutritious foods to their neighboring communities. This added depth to what I learned in the class prior to this experience and gave clarity for what I plan to do in my future career (AE). My interactions with the community and this child will be reflected upon for many years to come (RO). Not only did this service-learning experience strengthen communities abroad, but my experience left a lasting impression that will undoubtedly have a positive impact on my community back in the United States (AE). Not only did I learn about agriculture from this boy, but he also taught me about personal character and what it means to live life with an open mind and heart. Although we did not speak the same language, his smiles and ability to lead me through the rice fields showed a deep level of care and compassion. He did not [seem to] have any barriers towards me even though I was not from his community. I admire and respect his ability to see me for who I am and not what others may have led him to believe (RO).

Figure 3. Visual meaning for learning from locals

Student 3

There are countless ways, one can learn about Timor-Leste and its people. Regarding international development efforts in the country, I was most observant during the drives to sub-villages to inspect agricultural sites run by USAID and HIAM Health. As far as I can remember, I have always been silent during car trips. The reason for this is I have always been captivated and enthralled by the landscapes outside of my window (RO). Timor-Leste is considered one of the most remote countries in the world. It took our group over 30 hours to get to the nation (CE)… In fact, both USAID and the US Embassy deems it a hardship post, due to its lack of easy accessibility. We even experienced this [accessibility issue] when our only flight out of the country was canceled, leaving us stuck for an additional night (CE). Now, try to imagine attempting to access the remote communities within a hard to access country (AC). This photo perfectly depicts this ordeal. I took them on May 26th during the drive to a sub-village within the Maliana district. We went off the main route, drove on a rudimentary road, only accessible by vehicles with four-wheel drive, and traversed through a creek (CE). Please note that this was the dry season and not the rainy season. Along the entire drive, I remained fixated on the scenery outside my passenger window, rice paddies, local communities, and signs from past development projects (CE). Once we arrived at our sub-village, it finally dawned upon me one [of] the most significant challenges of development: usually, those most in need of assistance are the hardest to reach (RO). That's the challenge developmental agencies and NGOs must face daily around the world. Despite all these challenges reaching these communities, development practitioners still

[continue to try] (RO). It is a sign of dedication that I admire and hope to embody later in my career (AE).

Figure 4. Visual meaning for international development challenges.

Student 4

Our team had spent a couple of days preparing for our presentations of nutrition, general hygiene, and [pesticide] compilations/applications. Travels to the Manuruse Village took us up into the mountains to a small abandoned schoolhouse where we were greeted by community leaders, members, and their children (CE). [This community seemed] joyous to have Americans visiting their small, out of the way village, they quickly became friends. It was more like a homecoming than a first meeting… Dancing and food were woven through our day like a beautiful Tias [Timor-Leste woven cloth] (RO). During our community meeting, a long break allowed me to wander through the community. I was granted permission to walk up the road. My wanders allowed me to see housing, daily activities, soil profiles, crops being grown, and animals being harbored. Before long, three younger men participating in the community meeting joined me. They were curious about my nature and wanted to walk with me. Language barriers were broken by smiles, [periodic] demonstrations, and they took the lead to show their community (CE). The long path led us to an old church, the community's hub, and the most important to their culture. As I walked behind them, I began to think, these men will be the future leaders of their community. A phrase that I rely heav[il]y upon, 'People do not care what you know until they know you care'. We had spent most of the morning giving our perspective of what knowledge needs to be taught (RO). Breaking from the norm and walking with these young men, I realized they were happy to show us what is important to them. More questions flooded my mind… How often development projects are launched with no regard to the ideas and the thoughts of the nation's we are serving? (AC) To some this photo looks like an overgrown area with a well-beaten path. This photo brings me to my knees [, and through my understanding of it] allowing him to lead, supporting him with knowledge, and utmost care for his country, through his eyes. The future of their country lies in their hands (RO). As development agents, we can serve as their gloves; working together exchanging knowledge, care, respect, but most importantly, promoting leadership from within (AC).

Figure 5. Visual meaning for local engagement for a sustainable future.

Discussion

This study presented student reflections with representative photographs from a two-week international service-learning project using photo novella through the lens of Kolb's Experiential Learning Theory. By asking participants to tell the story of their photograph, researchers gained insight into the learning and reflection styles of the four students. Based upon Kolb's experiential learning cycle (1984), students' insight on the stages of abstract conceptualization (AC), active experimentation (AE), concrete experience (CE), and reflective observation (RO) were analyzed through their photo and narrative, which reflected the impact and learning from this experience.

Concrete experience (CE) was evidenced by portions from the narratives that depicted students' lived experiences during the ISL. Quotations that represented reflective observation showed the students reflecting consciously back on their experience. Students demonstrated abstract conceptualization through remarks showing their conceptualization beyond this experience from what they learned abroad. Finally, students evidenced abstract experimentation through statements that expressed the sentiment they would carry regarding what they learned from this experience as well as through their future careers. These stages demonstrated the variety of concepts and skills gained by the students through the process, reflected by their progression through Kolb's experiential learning cycle.

Connecting to Black and colleagues' (2013) research, the themes found with the students in Timor-Leste, such as communication, collaboration, and culture, indicate

that high-impact ISL experiences help students further develop their intercultural competencies. While the ISL was intended for students to propose solutions to the dynamic challenges faced by farmers in Timor-Leste, the photo novellas demonstrate that their experience left more than an academic impact on them. Students expressed how they learned culturally and personally from those they met in Timor-Leste, demonstrating the complex and diverse nature of ISL experiences. The use of service-learning in an international context is considered a high-impact learning experience. Capturing reflections through photo novellas was a mechanism to visually communicate learning. Based upon the visual depiction and narrative analysis, it can be concluded that learners were able to critically reflect upon their experience (Ash and Clayton, 2009). It is important to note, however, that these narratives were written by the students and only altered by the researchers when clarification was needed. Since Kolb's theory guided the analysis, researchers limited findings to the scope of that theory. Other areas, such as romanticization of the experience, were not explored through the analysis framework. However, it could be an avenue for potential intercultural skill development in future research. It is recommended that photo novella be used for interdisciplinary service-learning projects to describe the iterative process of action and reflection. While photo novellas are a powerful analytical tool to evaluate a field experience, it is recommended that it be used in conjunction with other evaluation tools, such as reflective journals or focus groups to provide evidence of impacts on experiential learning.

Graduate students with an interest in international development need authentic, action learning to develop competencies. Building off the recommendations of Homeyer and colleagues (2017), we encourage using photography—in this case, photo novella—as a reflective method in combination with others, such as reflective journaling and focus groups, during the ISL or other high-impact learning experience. The narratives that accompanied the photographs allowed researchers to view the experience from the student perspective visually, in a way that simple reflective narratives do not yield. This enriches the educational evaluation process from a researcher perspective, especially when combined with other assessment methods. Additionally, having students share their photo novellas in a group setting can allow the creation of deeper connections and understandings from the experience. It is also recommended that future research consider using international development competencies for entry-level agricultural development practitioners (Conner et al., 2013) for theoretical triangulation of photo novella data to measure other learning domains beyond experiential learning. This method could be expanded for the critical research paradigm and action research in agricultural and extension education contexts (Zuber-Skerritt, 2001).

By understanding the learning process that occurred during the ISL, educators can have insight into the student experience and understand the benefits and challenges faced by the students in-country, which will allow for the improvement of future ISL projects. Kolb's (1984) model allowed insights into this experience, and it is recommended that future research integrate other models, such as Kiely's (2005) transformative learning model for service-learning. By utilizing different analytical frameworks for student reflective narratives, researchers can assist with the methodological crossroads (Ziegert and McGoldrick, 2004) faced by service-learning research.

Innovative approaches to international development are critical to our profession. An implication of this study is that community engagement pedagogy can increase student professional development for careers in international development. Additionally, NGO and governmental grants and contracts need mechanisms to measure change and impacts of the proposed work. Through cooperation and cultural synthesis, we can solve complex problems and empower communities for a sustainable future.

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Enhancing Student Learning Using an International Trade Simulation Project

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Abstract

Given the importance of international trade to our economy and the reality that our students will enter a global workplace, this international trade simulation project provides students with a hands-on experience using practical tools to conduct international trade business. Student groups use role-playing to represent actual groups involved in international trade transactions: importer, exporter, importer's bank, exporter's bank, a shipping company, the government, and service agencies. Groups receive pre-designed information packages containing public information and group specific information including trade documents. Groups then interact to simulate the trade procedure for a specific commodity, starting from negotiation to the collection of payment, which closes the international trade loop. Results include positive feedback from students indicating that the project provided a "real life international business" experience and was "a great way to learn about international business documents first hand." Additional results include the ability for other faculty to use this international trade simulation model in their agricultural marketing, trade and business courses.

Introduction

Significance of the Agricultural Trade Business Class

The U.S. is the largest agricultural trader among all the countries in the world and trade represents 20% of farmers' income on average, and more for specific commodities—over 70% for cotton and some tree nuts and about 50% for wheat, rice, and soybeans (USDA-FAS, 2018; World Atlas, 2017). Both U.S. agricultural exports and imports have increased dramatically in recent decades with an overall agricultural trade surplus (export minus import values) since agricultural trade began in the 1960s (USDA, ERS 2019). This agricultural trade surplus contributes to reducing the overall U.S. trade deficit for nonagricultural merchandise trade.

Additionally, agricultural trade has been in the news given the U.S.-China trade war, which began in spring 2018 (Marchant and Wang, 2018) and continues to escalate as of this writing, May 11, 2019. Tariffs are a key component of this trade war and the U.S. imposed a new set of tariffs on US imports of Chinese good on May 10, 2019, increasing tariffs from 10% to 25% on $200 billion of Chinese goods with threats to increase tariffs on the remaining $300 billion of Chinese goods (The Economist, 2019). The Chinese have threatened to retaliate, and throughout this trade war have imposed tariffs on Chinese imports of U.S. goods, with agriculture being especially hard-hit. Thus, international trade is important to agriculture and tariffs are now part of the transaction.

To provide students training with hands-on experience in the international agricultural business trade, the College of Agriculture at California State University, Chico has offered its "International Agricultural Business Practices" course since 2008. The main goal of this course is to train students to master the important and practical tools for international agricultural trade business, including international negotiations and contracts (the Contracts for the International Sale of Goods--CISG), international trade terms (INCOTERMS2010), international transportation and shipping documents (Bill of Lading), international payments (Bill of Exchange), and the letter of credit (L/C), as well

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as the operational procedures of international trade of agricultural goods.

Difficulty of Understanding the Key Concept—Documentary Sales

In international business, one key concept is Documentary Sales, where the buyer (importer) pays for the traded agricultural goods (imports) upon receipt of complying documents, prior to receipt of the goods. These documents further described below include the Letter of Credit which guarantees payment, Bill of Lading which provides title for the traded goods and the Sales Contract describing the agreed upon price and quantity for the traded good. The Documentary Sales process protects the sellers' ability to receive payment and the buyers' ability to receive goods that conform to the sales contract. Even with in-class exercises, homework assignments, and quizzes, it is still difficult for many students to understand this concept well. A 2015 YouTube video by Pivateau helps to explain this complex process and this hands-on student role-playing project solidifies student learning making them job-ready for international agricultural trade.

Methods

Design of the Trade Simulation Project

To help students gain hands-on experience to conduct international trade business, we designed an experiential learning project for our "International Agricultural Business Practices" course. We adopted a main California crop, organic rice, as our traded commodity to simulate our international trade transaction of a U.S. exporter selling organic rice to a Chinese importer. Thus, this group project was titled "Exporting California Organic Rice to China." Before running this international trade simulation, detailed student instructions were carefully designed.

Students were divided into four groups as shown in our figure 1 flow chart and described below:

Group 1: U.S. Rice Exporter
Group 2: Exporter's Bank (2A), Shipping Company (2B), and Other Service Agencies (2C)
Group 3: Chinese Rice Importer
Group 4: Importer's Bank

Each group consisted of two to three students, who were given group-specific information containing detailed tasks for that group along with sample documents needed for the international trade transaction and associated grading criteria for each task. (Documents are available upon request.) To run this trade simulation project smoothly, two student project coordinators were selected: one for the U.S. as the exporting country (groups 1 and 2) and one for China as the importing country (groups 3 and 4). The two coordinators work together with respective team members and the instructor to keep this project running smoothly and within the project timeline of one month.

Key documents used in this transaction and given to student groups to complete include

(1) Letter of Credit (L/C), typically issued by the importer's bank, guarantees payment to the seller (exporter) on time and for the correct amount if various conditions are met.

(2) Sales Contract (S/C), is an agreement between the buyer (importer) and seller (exporter) specifying the sale including the commodity, quantity and price, shipping, payment, and any other terms or conditions. International sales contracts must abide by the United Nations Convention/Contracts for the International Sale of Goods (CISG) for its 90+ member countries, including the U.S. and China (UNCITRAL, 2019).

(3) Bill of Lading (B/L) is a document issued by the shipping company as cargo receipt that the commodity has been loaded onto the ship. Typically, the B/L used in international trade is a negotiable B/L; it is the title for the commodity and is transferable to a third party before the arrival of the commodity to the importer.

Additional documents given to students include the bill of exchange, commercial invoice, and packing list.

The Figure 1 flow chart (next page) describes this international sales transaction of U.S. rice exports to China, i.e., organic rice from California. The figure includes the above student groups who are role-playing actual exporter and importer groups and also includes the flow of documents, payments, and goods.

Detailed steps of the above flow chart for the international trade of goods using organic rice as an example follows. Note that although this figure first appears quite complex, to ease readability each of the following steps corresponds to a number in Figure 1. Also, common items are spaced consistently throughout the figure, e.g., payment flows on the outside, letters of credit on the inside.

(1) The exporter (student group 1) and the importer (student group 3) sign a sales contract (S/C) for the traded good (U.S. organic rice) after negotiation according to international rules—the Convention on International Sales of Goods (CISG). During this step, importer and exporter student groups receive group specific information about the organic rice supply and demand information to base their negotiations. When designing the information package, U.S. organic rice production costs and China's organic rice market price are carefully calculated with some room for both sides to negotiate price for higher profit margins. When negotiations are complete, the importer and the exporter sign the official sales contract (S/C) which specifies the commodity, its price, and quantity sold, ports of loading and destination, time of shipment and payment terms.

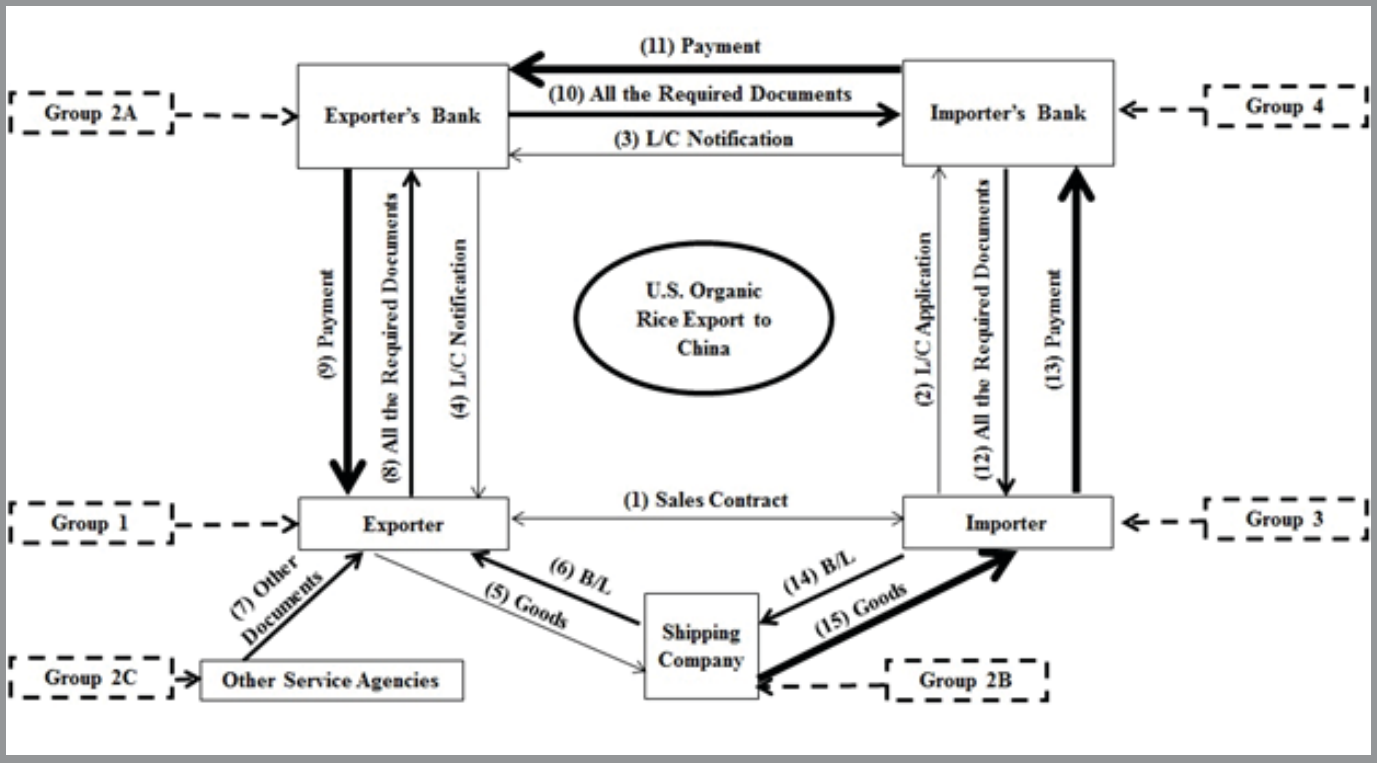
(2) The importer submits an application for a letter of credit (L/C) to the importer's bank based on the above sales contract. The importer will prepare the L/C application based on the signed sales contract and submits the L/C application to the importer's bank to process the official L/C.

(3) The importer's bank (student group 4) prepares the letter of credit and notifies the exporter's bank (student group 2A).

(4) After validating the authenticity of the letter of credit, the exporter's bank notifies the exporter of the arrival of the letter of credit so that the exporter can prepare the commodity for shipment.

(5) After receiving a copy of the letter of credit, the exporter

Figure 1. Flow Chart of Documentary Sales in International Trade Business



contacts its shipping company and arranges for shipment of the commodity, California organic rice. The price term selected for the project is CFR (Cost and Freight), meaning the exporter is responsible for shipping. Simultaneously, the exporter also provides detailed information to the shipping company, needed to prepare a complying bill of lading (B/L). Information includes shipper, consignee, notifying party, ports of shipment and destination, quantity of commodity shipped, weight, volume, freight charges, and timing.

(6) The shipping company (student group 2B) prepares and provides the shipping document— bill of lading to the exporter after loading the contracted goods (organic rice) on the ship, based on the information provided by the exporter in step 5.

(7) The exporter prepares and obtains other required documents according to the letter of credit. Some documents, including commercial invoice, packing list, and bill of exchange are prepared by the exporter. Other documents, including the certificate of origin and the certificate of organic, are obtained from other service agencies portrayed by student group 2C.

(8) The exporter presents all required documents, including the bill of lading, to the exporter's bank (negotiation bank) for negotiation (selling the complying documents to exporter's bank) within the validity date of the letter of credit.

(9) The exporter's bank validates all documents, including the bill of lading, and provides payment to the exporter as long as all documents are consistent with the letter of credit.

(10) The exporter's bank forwards the documents to the importer's bank, requesting repayment.

(11) The importer's bank verifies the documents and pays back the exporter's bank if all documents are consistent with the letter of credit.

(12) The importer's bank requests payment from the importer and forwards all documents to the importer, including the bill of lading, which authorizes title to the goods.

(13) The importer pays the importer's bank and obtains the documents.

(14) When the goods (U.S. organic rice) arrive at their destination port (e.g., Shanghai, China), the importer clears import customs and brings the bill of lading to the shipping company to obtain title. Additionally, any import tariffs are paid by the Chinese importer of U.S. goods via Chinese import customs.

(15) The shipping company delivers the goods to the importer, which ends the entire international transaction procedure.

Implementing the Simulation Project

To increase student involvement in the project and to avoid the free-rider problem, the number of students for each group should be limited to two to three students. Therefore, the total number of students, including two student coordinators, to run one simulation project is about 12-15 students. If the class size is large, several similar projects can run simultaneously. Regarding timing, this simulation project needs about one month for implementation. The instructor's involvement with continuous monitoring and oversight along with the project coordinators are critical to the success of this simulation project.

Results and Discussion

Students' Reflection and Improvements

Most students like this project and state that it significantly enhances their learning. A sample of student comments are listed below:

"I believe that this project was a hands-on approach to the material we learned in this class. I found this class and this project extremely helpful to real life scenarios. My family owns an agriculture business where we sell international commodities to South Korea and Japan. These different trade agreements and documents such as the bill of lading, commercial invoice and letter of credit we learned in this class are all used in our trade deals. The material we learned is also helpful in real life international business which is not always common in other classes. By completing the commercial invoice for this project and working with those that completed the Letter Credit, it gave me hands on experience with international business practices."

"After completing this project, I understand the process of importing and exporting products much more clearly."

"Overall, I thought this project was extremely beneficial as it gives students hands on experience with professional communication and the development of important documents involved in the import and export process. I really enjoyed this project and would recommend assigning it to students in the future."

"The project was an applicable learning experience because each of the groups learned what an importer, exporter or any of the banks do during international sales."

"This project was a great way to learn about international business documents first hand."

"I graduated in May and started working for a company here in Chico called Farmers International. Your International business course has served me very well as I create international contracts, invoices, and use the Incoterms daily. I was wondering if there was someone I could recommend that your course be added to the core Agricultural Business program."

This project also faces some challenges: 1) It takes a long time to finish, normally over a month; 2) It requires a lot of coordination and communication. Good project coordinators for the project are very important; 3) The free-rider problem happens and must be handled; and 4) Evaluating individual students and assigning point value for this project is challenging. Although challenges exist, the reward from students' realization of the value of this knowledge is well worth the effort.

Next Step for the Future

The next step is to expand this model to a real international scenario: finding an overseas collaborative university, which offers a similar class and run this trade simulation project between students from two countries.

Summary

International trade business is much more complicated than domestic business. It takes more time, involves more parties in the process, and faces more risks. At the same time, international trade may also bring in more profits for businesses. While teaching international business practices in the classroom is challenging, this international trade simulation project is a good way to tie in-class concepts together and helps students understand the overall process of international trade. The initial design of this project aims to involve all students. During implementation of this project, students "think it was valuable to our education and overall knowledge of international business" and they "appreciate how difficult international trading is in real life." If this simulation can be run between students from two countries in the future, students will be able to appreciate the real international flavor even more through this simulation project.

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Global Resource Systems: A Curriculum to Train the Next Generation of Global Leaders

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Abstract

A college-wide, interdisciplinary and globally focused undergraduate major in global resource systems (GRS) at Iowa State University (ISU) provides a model to globalize the curriculum and offer courses with an international focus. By utilizing an interdisciplinary systems perspective to analyze resources, students learn how the world uses its limited resources and to plan for their efficient use to create sustainable systems. Descriptions of the planning and development of the GRS major at ISU and context for a new, college-wide major include its unique curriculum model and co-curricular activities, related activities of the major, characteristics and success of graduates during the major's first decade of operation, funding, and ideas for the future development of the program. High-impact educational activities in GRS major's curriculum and co-curricular programs consist of a learning community, study abroad, service learning, honors program, global internship, faculty-mentored senior-level research project, and collaborative senior team capstone project for a real-world global client. A majority (87%) of student respondents (62% of invited participants) in a survey at the time of graduation between 2015 and 2018 indicated they were strongly satisfied or satisfied with the GRS major and their experiences as a GRS student.

Introduction

Undergraduate students in agriculture and related disciplines need greater exposure to the international dimensions of their disciplines. Both learning abroad and international perspectives embedded in courses can contribute to this exposure and increase global competencies (National Research Council, 2009; Shcheglova et al., 2017). Engagement of college students in global resource systems is critical for future leaders in agriculture and citizens of an interconnected world. Students need to be able to comprehend, analyze and evaluate new knowledge in a globalized world and one way to increase students' understanding of global food and agriculture is to globalize the curriculum (NASULGC, 2004). Additionally, the development of an interdisciplinary perspective is critical to the formation of globally prepared leaders with an appreciation of the contributions of multiple disciplines in solving complex problems.

A college-wide, interdisciplinary and globally focused undergraduate major in global resource systems (GRS) at Iowa State University (ISU) provides a model to globalize the curriculum and offer courses with an international focus. By utilizing an interdisciplinary systems perspective to analyze resources, students majoring in GRS learn how the world uses its limited resources and to plan for their efficient use to create sustainable systems.

The planning and development of the GRS major at ISU are described. The context for a new, college-wide major, its unique curriculum model and co-curricular activities, characteristics and success of graduates during the major's first decade of operation, funding, and ideas for the future development of the program are presented. This study was deemed exempt by the Iowa State University Institutional Review Board under federal regulation 45 CFR §46.101(b).

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Context for the Global Resource Systems Major

Through a semester-long planning phase in 2008, 13 faculty from 10 different departments in ISU's College of Agriculture and Life Sciences discussed the type of world our graduates likely will inherit in the future and the appropriate outcomes of an educational program aimed at preparing them for a globally interdependent future. The rationale for developing a new undergraduate Global Resource Systems (GRS) major to produce globally competent graduates stemmed from the confluence of seven factors.

First, the faculty planners observed that we all had regular opportunities to engage with our disciplines in different parts of the world and little of the experience and knowledge gained made its way back to the classroom. Faculty expertise could be integrated intentionally into courses in the major. It also occurred to us that the worldwide professional connections of faculty could be tapped for student experiential learning such as through internships. Second, we were influenced by the literature of that time. Thomas L. Friedman (2008) had just published his book, Hot, Flat and Crowded. The predecessor organization to the Association of Public and Land-grant Universities recently had produced a report that stated internationalization "is the single most important leadership challenge of the new century" (NASULGC, 2004, p. 8). The U.S. Senate designated 2006 as the "Year of Study Abroad" to encourage students to gain international experience (United States 109th Congress, 2005).

Third, we observed that resource sustainability issues occurred across borders and needed to be understood in their global context and the grand challenges facing the planet were complex and required multiple disciplines to understand and address them. Fourth, we examined existing undergraduate majors around the world that had significant international content. We attempted to build on those experiences to design a unique new major at ISU with a strong systems-focus.

Fifth, we had experienced rapid growth in our study abroad and service learning programs over the previous dozen years. We observed that in-depth, experiential immersion programs in another culture had deep and transformative impacts on students' personal and professional development. Our previous experience in sending undergraduates to Uganda and Peru for service learning programs gave us confidence that we could successfully manage the placement of international interns throughout the world. Sixth, because of our 15-year partnership with the youth programs of the World Food Prize Foundation we regularly encountered high ability secondary school students who were passionate about feeding the world and global issues but had little or no knowledge of agriculture. These students were looking for places to build their skill sets to have an impact in the future.

Seventh, we conducted a survey to better understand how a 21st-century major devoted to global resource issues would be perceived by employers. Employers were looking for graduates who were systems thinkers, had strong global and cross-cultural skills, and could lead interdisciplinary teams.

Curriculum

The GRS major's curriculum was designed to employ an interdisciplinary and systemic approach to understanding complex global resource issues (Iowa State Univ., 2019). The GRS major requires students to develop competencies about a world region they choose and also an additional world language in which to specialize (Figure 1). They develop competency in that language at the minimum of an intermediate level and participate in at least one significant cross-cultural immersion and experiential learning internship. Students develop a core set of technical competencies in a resource area they select from the 23 primary majors, two secondary majors, 25 minors, and one certificate offered by the College of Agriculture and Life Sciences. Students complete a senior project related to their resource specialization within the context of the world region, which may be informed by their internship focus. They also complete a capstone course with analysis of critical global resource challenges facing both developing and developed countries, while working collaboratively in teams and with real-world client projects.

Figure 1. Recruitment card used to summarize and explain the Global Resource Systems curricular requirements, including global competency (world region), world language (language), discipline (area of expertise), global internship, senior research project, and senior capstone project.

Table 1. Curriculum requirements of Global Resource Systems, a primary college-wide major in the College of Agriculture and Life Sciences, Iowa State University.

Curriculum Section	Minimum Number of Semester Credits	Additional Information
Communication Proficiency	13	English, speech, library
Humanities, Social Sciences, Ethics, U.S. Diversity and International Perspective	15	Selected from approved course lists
Mathematical Sciences	6-7	Mathematics and statistics
Global Competency	15-31	World language to intermediate level (16 credits); Global competency courses from approved list (15 credits)
Life and Physical Sciences	15	Biology, chemistry, and earth science
Global Resource Systems	23-26	Global Resource Systems courses
Technical Concentration	15-18	Satisfied by completion of a minor, additional major, or certificate offered through the College of Agriculture and Life Sciences; minimum is a minor
Electives	11-16	
Total	129	Sufficient coursework to ensure not less than 129 credits

Multidisciplinary themes are developed in the context of the physical, biological, and socio-economic factors affecting global resource systems. In this context, resource systems include food and agricultural, natural, environmental, cultural and human, political and institutional, financial and built environment, and social resources. Graduates of the major receive a Bachelor of Science degree and have transnational leadership skills and are successful integrators of various specializations on a team. They are skilled in applying a systemic perspective and developing solutions to complex global resource systems' problems using innovation and creativity. Future professionals meet additional college and major learning outcomes by communicating effectively, demonstrating environmental awareness, exhibiting an ethical perspective, and displaying a clear analysis of how cultural diversity impacts work both here and abroad.

Administration

A Faculty Coordinator was appointed to manage the curriculum and major, which are overseen by a supervisory committee that is comprised of college administrators and department chairs who have administrative responsibilities for undergraduate majors offered in their departments. An external advisory council advises the college on building and sustaining the major, including providing counsel and advice on programmatic content and administrative effectiveness and opportunities. The advisory council members include ISU academic representatives and external non-governmental organization and agricultural business leaders, as well as current GRS students and alumni. The college administration facilitates the annual meetings of both the supervisory committee and advisory council, where the Faculty Coordinator provides a summary report.

High-impact Learning Experiences

The curriculum includes high-impact learning experiences with the goal of academic preparation and student success in engagement and learning. Participation in at least two, high-impact, educational learning activities is a metric of ISU's strategic plan to "to prepare students for lives and careers in a dynamic, global community" (Iowa State Univ., 2016). In addition to the requirements listed above, GRS majors benefit from a number of high-impact educational activities such as a course-based learning community, study abroad, and service learning. Qualifying GRS majors participate in ISU's Honor's program and most students complete their honor's project with GRS faculty. Honor students may petition faculty of GRS courses to have an honor's designation for other GRS courses, increasing the rigor and requirements of the course. Students attend relevant educational conferences and contests in the U.S. and other countries to share findings of their senior research projects or represent co-curricular clubs.

GRS Courses

The GRS curriculum meets university and college general education requirements for a Bachelor of Science degree. GRS is the first and only major in the College of Agriculture and Life Sciences requiring an additional world language, in which students become proficient to at least the intermediate level, and 15 additional semester credits of global competency courses. The degree requirements, curricular sections, and their number of semester course credits are summarized in Table 1.

Active learning, case studies, and team-based learning are used throughout the GRS curriculum, with opportunities for service learning and engagement in selected courses. GRS course offerings have most lower-division and all upper-division courses team-taught by faculty. Outside and

diverse perspectives are shared with students through guest lectures and small group discussions with multidisciplinary experts from governmental and non-governmental organizations, multilateral international bodies, U.S. and foreign universities, and corporations. Core GRS courses include an orientation (GLOBE 110, 1 credit (cr.)), introduction to global resource systems (GLOBE 201, 3 cr.), agriculture, food and natural global resource systems (GLOBE 303, 3 cr.), socio-economic global resource systems (GLOBE 304, 3 cr.), global resource systems internship preparation and internship (GLOBE 320, 1 cr.; GLOBE 321, 3-6 cr.), senior project (GLOBE 401, 3 cr.) and responses to global resource systems challenges – capstone (GLOBE 402, 3 cr.). Additional courses include seminar courses that address issues in global resource systems and independent study on topics of special interest to the student. Service learning courses are offered for domestic and international experiences (GLOBE 494, arranged cr.) and service learning projects are integrated into GLOBE 201.

Student majors provided input about the curriculum near the end of their last semester through senior surveys and exit focus group discussions. They stated the need for and benefits of additional coursework in geography and career planning; faculty developed and now offer these courses, geography of global resource systems (GLOBE 120, 3 cr.) and a career-specific seminar offered through the course, issues in global resource systems (GLOBE 211, 1 cr.).

Study Abroad

Study abroad courses offered by GRS faculty are varied and include programs such as travel study (GLOBE 496, arranged cr.), service learning programs (GLOBE 494-A, arranged cr.), and concentrated immersion experiences (GLOBE 497, 1-4 cr.). Travel study courses in food and agriculture are provided for first-and second-year GRS students for their first, university study abroad experience. All study abroad courses include pre-departure preparation within the GLOBE 496 or as a separate course before travel (GLOBE 495, 1-2 cr.). In addition to other study abroad scholarships, the College of Agriculture and Life Sciences provides a scholarship for students to receive reimbursement for the price of a passport, since the study abroad program may be the first international experience for some students.

Global service learning courses in Uganda offered as semester-long and short-term summer programs (GLOBE 494A, 3-6 cr.), provide students the chance to learn about a development program in rural Uganda while contributing to a school garden and lunch program and small-landholder farmers and youth entrepreneurs. Integration of structured service learning into global opportunities impacts positively students' global and intercultural competencies (Stebleton et al., 2013). An immersion program allows students to concentrate on real-world projects with professionals at the Food and Agriculture Organization of the United Nations (GLOBE 497).

Courses for the required global internship prepare students before departure (GLOBE 320) and provide post-experience reflection and sharing of their experiences in the semester after their return in class and to the university-wide community (GLOBE 321). Guided reflection prior to, throughout, and after an international experience such as a global internship allows students to think about and make meaning of their global experience (Stebleton et al., 2013). During the time period of 2010-2018, 198 GRS students completed their internship in various organizations, including research laboratories in foreign universities and institutions, non-governmental organizations working in development, and global corporations with worldwide food and agricultural businesses. GRS students interned in 47 countries in six continents and the number of students completing internships in different continents was: Africa (n = 63); Asia (n = 44), Australia (n=1); Central and South America, (n = 48); Europe (n = 31); and North America (n=11). Most GRS majors typically complete their internships in the summer after their junior year, returning to campus for their senior year. The basic requirement includes five weeks, but additional weeks are encouraged and internships have ranged from five weeks to semester-long. Students play a role in establishing their internship goals and selecting potential institution(s) and geographic location(s) through mentoring and assistance from faculty members and staff of the college study abroad programs. After their global internship, students share their internship experiences and reflections through written and oral reports, essays, letters, and displays; they reflect upon the impact of their internship experience on their worldview and educational and career goals. They analyze the accuracy and relevancy of their own worldviews and anticipate how people from other nations may perceive that worldview. Graduating seniors, in each semester from spring 2012 through fall 2018, stated in senior exit interviews and focus group discussions that their global internship was one of the most impactful and transformative curricular experiences and that the required internship and its scholarship support should be maintained in the major.

Undergraduate Research

The senior project and associated course of GLOBE 401 are completed in collaboration with faculty mentors. Students identify the project, which complements a student's technical discipline and world region of interest. The topic may have been researched initially during their internship and information gathered could bring a focus to a research topic or data to be analyzed; the topic also may be determined in their senior year based on student experiences during the previous years. The senior project requires students to use critical thinking skills to evaluate the ecological, economic, and social consequences of the utilization and distribution of global resources and their systems; formulate and evaluate potential solutions to regional and global challenges that are sustainable and ecologically, economically, and technically feasible; develop and understand strategies for using human and natural resources to positively impact regional and global societies; use credible sources to define the scope of regional and global challenges; and communicate effectively with diverse audiences using written, oral, visual, and electronic presentation skills, including with a poster presentation

in a scientific meeting format open to the university-wide community and a final report of a minimum of 20 pages. Undergraduate students enrolled in the Honors program at ISU may use their GRS senior project to fulfill the Honors program undergraduate research requirement.

Senior team capstone projects (GLOBE 402) typically are completed in students' eighth and last semester. Real-world clients are sought by the GRS-supervising faculty and resource system projects related to global issues and of value to a client are shared with students for their selection. Teams of four or five students implement effective communication strategies of written, oral, visual, and electronic means for diverse audiences of classmates, instructors, and clients; apply effective team and leadership skills; examine and explain critical global resource challenges with a discipline-specific and interdisciplinary lens; evaluate and analyze critical global resource challenges; critique, analyze, and integrate diverse, credible research for potential solutions of critical global resource challenges; and evaluate and formulate potential solutions to these challenges.

Area of Expertise

The GRS degree program is a primary major but requires another major, minor or certificate of the college. Completing an area of expertise within the college provides advantageous flexibility for students to complete two majors, and thereby offering the learning of a technical discipline at a deeper level. General education requirements are similar across the college and students can simultaneously complete the curricula of two majors without additional semesters if the two majors are declared early enough in their degree programs. Summary data of GRS graduates of the last eight years showed 72% of 161 students had completed two majors (Table 2). The food and agriculture disciplines with the highest number of students included environmental science/studies, plant sciences, human nutrition, and food science, and sociology (Table 2).

Co-curricular Activities

Co-curricular activities can help to successfully prepare globally competent graduates. The GRS program directly leads or supports each of the following enrichment activities.

GLOBE Learning Community

The GLOBE Learning Community aims to build community among students and faculty in the major. It supports first-year and transfer students in their transition to university life and in making connections with faculty and other students majoring in GRS. GRS students entering the university enroll in the same GRS orientation class and also in general education classes with a cohort, in both fall and spring semesters of their first academic year. GLOBE learning community peer mentors, who are GRS majors, assist students in GRS courses, mentor their transition to the university, tutor subjects, and also plan and promote additional program activities. Non-course activities are educational with the goal for students to experience higher academic achievement, awareness of the program, college and university resources, and improved knowledge and skills related to career opportunities. Peer mentors also lead social activities to develop students' sense of belonging in the university community and a higher level of satisfaction with the university experience. Mentors also encourage and facilitate new students' involvement in other co-curricular clubs and programs and share information with the entire GRS student body through a weekly student-edited electronic newsletter and social media.

Peace Corps Prep Program

ISU and the U.S. Peace Corps announced the ISU Peace Corps Prep Program in 2016. ISU is the only college or university in the State of Iowa to have a Peace Corps Prep Program, which is administered through GRS and

Table 2. Number and percentage of student graduates completing the Global Resource Systems (GRS) major at Iowa State University, 2010 – 2018, (n=161)

Number and Percentage of Student Graduates								
Area of Emphasis[z]			Discipline of Area of Emphasis[y]			World Language [x]		
Major	Minor	Environment	Plant Science	Food/Nutrition	Sociology	Major	Minor	Intermediate-Level Proficiency
116 (72%)	104 (65%)	40 (25%)	25 (16%)	24 (15%)	15 (9%)	5 (3%)	20 (12%)	136 (84%)

[z]Students met additional discipline requirement by completing an additional primary major (Major) or a minor (Minor) in the College of Agriculture and Life Sciences; 59 students completed both an additional major and minor; 45 students met the GRS curricular requirements with a minor only.

[y]Disciplines of additional major or minor with the most students included Environment = environmental science and environmental studies; Plant Science = agronomy, forestry, and horticulture; Food/Nutrition = nutritional science, dietetics, food science, food safety, and culinary science; Sociology = ag and society.

[x]World language requirements met by completing another language at the intermediate level as a minimum. Twenty-five students completed another major or minor in world languages' curricula. Languages completed as an additional major and with the most students included French (n=2) and Spanish (n=2); as an additional minor and with the most students included Spanish (n=13) and Chinese (n=4).

prepares ISU students for service in the Peace Corps or other global organizations upon graduating. GRS majors complete relevant curricular and co-curricular aspects to help prepare them for the Peace Corps volunteer service. Thirteen GRS alumni have served or are serving as Peace Corps volunteers in countries in Africa, Asia, and Central and South America, with nine GRS alumni placed since the inception of the Peace Corps Prep Program.

Leadership Training

A leadership program is offered to first- and second-year GRS majors and is facilitated by the GRS Faculty Coordinator. During a semester-long program, students explore leadership philosophies and learn techniques and skills enabling participants to develop as leaders at ISU and beyond. Peer leaders assist in the weekly sessions of the GLOBE Leadership Fellows program. A separate GRS Leadership Academy offered as an academic-year-long program starting in 2018 includes junior and senior GRS majors selected through an application process. The objectives of the GRS Leadership Academy are to assist students in their development as GRS majors and future global leaders; challenge students to critically examine leadership at the intrapersonal, interpersonal, team, and organization levels; bring students into contact with industry leaders and ISU faculty from diverse backgrounds and leadership experiences; and provide opportunities to exercise leadership behaviors in teams and individually.

GLOBE Ambassadors

The student ambassadors' role in GRS is to educate the public and potential students about the major while fostering student leadership, engagement, and professional development for members. Volunteer ambassadors meet biweekly in each semester to plan upcoming events and recruitment activities. They create recruitment materials, lead activities such as youth workshops on- and off-campus about international topics, and give presentations at about six admissions-related, recruitment events per semester.

Student Clubs

GRS majors participate in student-led clubs on the ISU campus. Clubs currently relevant to global resources in which students are active include the International Association of Students in Agricultural and Related Sciences (IAAS), Global Health and Aids Coalition, International Student Council, Oxfam America, and United Nations Children's Fund (UNICEF). Students regularly participate in global youth meetings and conferences on- and off-campus. Two GRS students served as President and on the executive board of IAAS World during the academic years of 2013-2014 and 2018-2019. A team of six GRS majors participated in Rio+20 United Nations Conference on Sustainable Development in 2012.

Entrepreneurial Training

GRS majors have the opportunity to participate in entrepreneurial activities. They have volunteered for and/or co-led start-up activities of several entrepreneurial programs. Several GRS students participated in the Thought For Food™ Challenge and later founded KinoSol (2019), a Specific Benefit Corporation focused on decreasing food waste. As its first product, KinoSol's members designed a small-scale, solar-powered food dehydrator for use in developing countries.

Related Activities of Major

Recruitment

There are a number of target audiences for GRS recruitment including entering first-year students and transfer students. Entering students indicated that they learned about the GRS major at ISU from the Internet (www.globe.iastate.edu) and recruitment materials build upon ISU Admission's key messaging of "Choose Your Adventure" (http://catalog.iastate.edu).

Increasingly, students are entering college with one or more international experiences and are eager for more (Harrell et al., 2017). This group of students is willing to consider a major that requires more in-depth international engagement. Potential students who already show an interest in topics related to food security and global issues include participants in the World Food Prize Youth Institutes, which are offered in 20 states. In the Iowa Youth Institute, held for an entire day, "students are able to explore majors and careers related to combating global hunger & poverty while also presenting their own ideas and solutions to real-world experts and professionals." (World Food Prize, 2019).

Alumni

An alumni event was launched in 2016 and each year includes informal, small group discussions and seminars and/or panels by GRS alumni, who were invited back to ISU to engage with current students. In senior exit focus group discussions, students stated that GRS alumni events had meaningful interactions, informed students about possible careers, and increased confidence in students about their future goals and career plans. GRS alumni regularly mentored current student majors with similar interests, when asked.

Alumni work in global businesses, government agencies, non-governmental organizations, globally engaged foundations, educational institutions or volunteer organizations, and are based both internationally and domestically. GRS majors are competitive to attend graduate and professional school and are enrolled in programs in the U.S., Canada, and Europe. From 2010- 2018, 161 GRS majors, 72% female and 28% male, graduated and became alumni of the major. Forty-two percent (n=68) of all students graduated with distinction (≥3.5 overall grade point average) and the mean grade point average of all 161 graduates was 3.31/4.0. The academic achievements are high considering that 72% of the graduates completed curricula for two majors (Table 2).

Placement data from the college's Career Services office of 161 GRS alumni graduating in fall semester 2010 through spring semester 2018 indicated a placement rate of 100% (M. Gaul, personal communication). Initial placement of alumni

in the first six months after graduation included 15 different food and agricultural businesses, 14 other businesses, 12 local, state and federal governmental agencies, 18 non-governmental organizations, and 5 educational institutions. GRS graduates also directly enrolled in at least 20 different graduate and professional schools/colleges in the U.S., Canada, and Europe. Examples of students' graduate disciplines include agricultural and resource economics, development economics, development studies, food and rural development, rural sociology, community and regional planning, comparative and international development education, geography, agronomy, horticulture, plant pathology, land resources and environmental science, sustainable agriculture, agricultural engineering, public health, and medicine.

Sixty-one of 98 graduating seniors completed a senior survey (62% of possible respondents) in their last semester and between fall 2015 and through fall 2018 semester (surveys of seven semesters). The question was asked: "Overall, how do you feel about your experience as a Global Resource Systems student? Please respond to your level of satisfaction with the Global Resource Systems major." A majority (87%) of respondents indicated they were strongly satisfied (54.1%, n=33) and satisfied (32.8%, n=20). Respondents who were neither satisfied or dissatisfied were 11.5% (n=7); one student (1.6%) was dissatisfied, and none (0 %) was strongly dissatisfied.

Funding of Major

The content of the GRS major lent itself to being established as a college-wide major. Thus, the program was launched with a modest funding commitment from the college dean's office. A Faculty Coordinator was selected in 2008 and was provided initially with 50% time of their faculty appointment. A number of faculty agreed to teach part-time in the program.

In 2008, amidst significant financial uncertainty in the U.S. for many colleges and universities, including budget constraints at ISU, it was clear that significant funding would not be forthcoming for an untested (and unheard of) new major. At the same time, the program had ambitious goals to deliver a world-class, high-quality undergraduate majors and programs, including an international internship and to guarantee funding for at least the airfare for each intern. The cost of international engagement is frequently cited as the principal barrier for undergraduate students (Edgar et al., 2018). Noting this challenge, the Faculty Coordinator began raising funds for all GRS programs and activities from a variety of internal and external sources. These sources included private donors (mostly ISU alumni), government grants (USDA), and corporate partners (multinational agribusinesses). The ISU Foundation joined forces with the Faculty Coordinator to suggest the idea to additional donors.

Success often breeds additional success. As talented GRS interns returned to the US and made high-quality presentations to donors the pool of funding increased. The overall success of the program also impressed donors with some stepping forward to fully fund a Global Professorship in Global Resource Systems for the Faculty Coordinator. The Faculty Coordinator could then direct those funds to further enhance the professional development of GRS students and faculty.

Future Opportunities

GRS provides a relevant model to train the next generation of agricultural leaders who integrate multiple disciplines and global competencies to solve complex problems. In January 2019, the official number of currently enrolled GRS majors was 140, which grew from 17 students in 2009 and had 161 alumni by December 2018. For GRS to sustain and grow in the future, we believe the following aspects are needed: university- and college-wide administrative leadership support; integration with university and college programs and resources; a strong faculty and staff including tenure-track and term faculty; and financial support for scholarships and programs through combining efforts with the university's foundation. Future considerations of potential areas to grow are the addition of a graduate program; a study abroad program in the developing world for a sophomore experience; offering GRS courses online to facilitate continued progress while students are studying or interning abroad; and increased interactions with advisors of other majors at ISU, from which students could add GRS as an additional major, and community colleges, from which students often complete their baccalaureate degree at ISU.

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Developing Intercultural Competence and Ethnic Identity among Undergraduate Students in Agriculture and Human Sciences

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Abstract

Agriculture faculty have recognized that leadership courses and programs are an important component in university agricultural curricula across the United States, and one way to develop better leadership skills is through intercultural competence. The purpose of these two studies was to develop intercultural competence among agriculture and human sciences undergraduate students. The goal of Study 1 was to increase students' ethnic identity over the course of one semester in the classroom by utilizing ancestry DNA analysis. The goal of Study 2 was to increase intercultural competence (using the Intercultural Development Inventory) among undergraduate agriculture and human sciences students with high-impact classroom curriculum. Data came from undergraduate students in an agriculture college at a large southern university in the United States. Over the course of the semester, students showed significant improvements in self-reports of ethnic identity and belonging. However, there was no significant increase in intercultural competence. Study 1 illustrated how Ancestry DNA analysis can significantly impact students' ethnic identity development. Study 2 may provide high-impact classroom activities that can be used to develop students' intercultural competence in order to provide better leadership tools working in a global workforce.

Introduction

The use of 'HWCU' [historically white colleges and universities] has become widely used to refer to institutions of higher education whose histories, traditions, stories, curriculum, and policies were all designed by whites, for white students, and to reproduce whiteness via a white experience (Brunsma, Brown, and Placier, 2012). There are currently 4,683 institutions of higher education in the United States, and only 101 of these are historically black colleges and universities (HBCUs), leading to the assumption that approximately 98% of institutions are likely traditionally and historically white. Along with this, newly emerging challenges in the agriculture system, especially in both higher education and the agricultural industry, are diversity and social equity issues. Social equity issues, including those relevant to gender and ethnic minorities, are major concerns in agriculture since they relate to poverty, hunger, nutrition, health, natural resource management, immigration and pathways to citizenship, and the environment. In the United States, approximately 92% of farmers identify as non-Hispanic White, and more than 86% of those farm operators identify as men (Jenner, 2014). The average age of farmers, which has been rising for decades, continues to increase. However, the majority (73%) of all agriculture workers are foreign born, while 28% of agriculture workers and 31% of American farmers identify as female (NCFH, 2014; USDA, 2019). Thus, more attention is required to appropriately address diversity and social equity issues among agriculture fields, as well as creating an environment of inclusion where everyone is respected and valued. Unfortunately, higher education institutions and agriculture fields may be producing students and professionals "who emerge from universities with their walls of whiteness essentially unchallenged, unscathed, and often, strengthened" (Brunsma et al., 2012, p. 718). One way to dismantle "walls of whiteness" is to increase intercultural competency among

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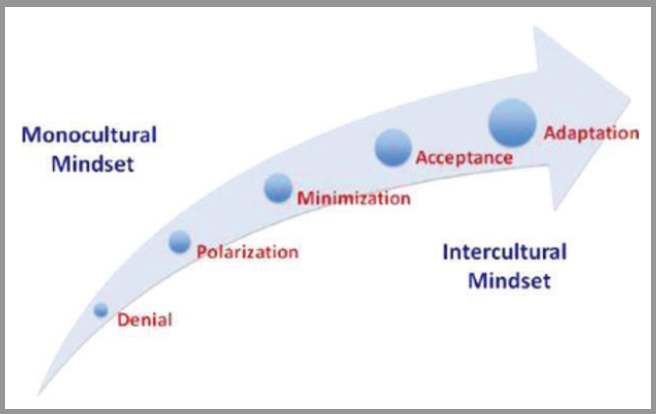
students pursuing agriculture and human sciences majors and careers.

Agriculture faculty have recognized that leadership courses and programs are an important component in university agricultural curricula across the United States (Birkenholz and Schumacher, 1994; Velez et al., 2015), and one way to develop better leadership skills is through intercultural competence. Indeed, the ability to engage in effective interactions across cultures is essential in the 21st century for agriculture leaders (Hammer, 2008). Intercultural competence is an awareness of one's own cultural identity and the ability to interact effectively and appropriately with people from other cultures. A typical way to conceptualize intercultural competency is along a continuum of five stages (The Intercultural Development Continuum (IDC TM); refer to Figure 1): *Denial, Polarization, Minimization, Acceptance and Adaptation. Denial* (i.e., disinterest, avoidance) reflects limited experience and capability understanding and responding appropriately to cultural differences in values, beliefs, perceptions, emotional responses, and behaviors. *Polarization* uses an "us vs. them" mindset either through Defense (seeing cultural differences frequently as divisive and threatening to one's own way of doing things) and Reversal (valuing other cultural practices while denigrating one's own culture group). *Minimization* is highlighting commonalities too much that can mask a deeper understanding of cultural differences (i.e., color blindness, "I don't see color"), while *Acceptance* recognizes and appreciates patterns of cultural differences and commonality in one's own and other cultures, but with the inability to adapt to cultural differences.

Figure 1. Intercultural Development Continuum



Lastly, *Adaptation* is when one has a deep cultural bridging across diverse communities using an increased repertoire of cultural frameworks and practices in navigating cultural commonalities and differences.

One strategy that HWCUs can do to increase [white] students' intercultural competency is identifying teaching tools and activities that are effective. One way to increase intercultural competence is increasing students' awareness of their ethnic identity. First, ethnicity refers to the idea that one is a member of a particular cultural, national, or racial group that may share some of the following elements: culture, religion, race, language, or place of origin (Phinney, 1992). Ethnic identity development includes the identity formation in an individual's self-categorization in, and psychological attachment to, an ethnic group (Phinney, 1992). This can increase belonging and identification with a group, shared commitment and values, and enhances social development and self-awareness.

One unique and innovative way to increase ethnic identity is by using ancestry DNA analysis, which is available through a number of websites. The emergence of big data has transformed the use of genetic ancestry testing as a way for people to learn more about their family history, which is important in shaping one's identity (Royal et al., 2010). By exploring one's cultural identity, students' cultural awareness will help them see the world through multiple perspectives, enhance communication and interpersonal skills, model open-mindedness, understand and appreciate diverse communities, and advance their career development through knowledge and understanding of different cultures. However, like most Americans, students are not aware of who they are or where their families came from. DNA testing, provided by a lot of companies, such as Ancestry.com, can help individuals gain insight about themselves and their families. Genealogy has been a practice in many cultures, and projects light upon the way in which families have conducted themselves in the past. Further, it is becoming increasingly popular and a highly time-consuming recreational activity and as such is a phenomenon worthy of research (Erben, 1991) for enhancing intercultural competence through identity development. Genealogy is more than just tracing one's family tree, it is about discovering family heritage, and creating a story about how a family developed and formed in history. Thus, the DNA analysis is a unique and innovate activity to advance a genealogy project by providing students with empirical DNA data about their ethnic and family identity. Understanding oneself is one of the first crucial steps in developing intercultural competence.

Current Studies

Two studies were conducted. The overall purpose of these studies was to increase intercultural competence among undergraduate students in agriculture and human sciences. The primary goal of Study 1 was to increase undergraduate students' ethnic identity over the course of one semester in the classroom. Utilizing AncestryDNA analysis, this project was an innovative way for students to understand where they come from. It provided empirical data of their genetic ethnicity by comparing DNA to the DNA of other people who are native to a region (which contains 3,000 DNA samples from people in 26 global regions). The project was inspired by "Who Do You Think You Are?", an Emmy-nominated show on TLC that follows different celebrities and their family genealogy. It follows the journeys of some of the most well-known names in American popular culture. Each show displays a new celebrity who discovers unknown details about themselves and their families while researching their ancestry with the help of historians and genealogical experts. The primary

goal of Study 2 was to increase intercultural competence among undergraduate agriculture and human sciences students through high-impact classroom activities, by using the Intercultural Development Inventory (IDI) to assess pre- and post-test differences. This study was inspired by the IDI that utilizes a development plan for individuals to increase their intercultural competence, in which they choose their own activities and set their own goals.

Methods

Study 1 Participants

Data for this study came from 34 undergraduate students (Mage = 22.42, 85% White, 85% female) in a Human Sciences course in an Agriculture college attending a large southern university in the United States. These students were enrolled in a senior-level course that provides opportunities for students to gain awareness of their own cultures and families, reflect on families from a diverse array of cultures, and to develop critical thinking skills needed to effectively engage with people and families from cultures different than their own. Students are required to write a paper on their genealogy and family background from family interviews, while also including academic resources. Students participated in the study by providing responses to pre- and post-test assessment on their ethnic identity. They were also asked to participate in a DNA analysis provided by Ancestry.com, which was funded by a teaching grant to the primary author; all students volunteered to participate and IRB was deemed exempt by the primary institution of data collection. Students signed up on Ancestry.com to receive their DNA testing tube, which was sent within 1 week (requires spitting in the tubes and then are returned via mail); their Ancestry DNA results were sent within 6-8 weeks via email. Students then responded to a post-test follow-up survey and created their genealogy project during the last month of class.

The Multigroup Ethnic Identity Measure (MEIM) (Phinney, 1992) has been used in multiple studies and has shown good reliability across a wide range of ethnic groups and ages. The measure is comprised of two factors, ethnic identity search (a developmental and cognitive component) and affirmation, belonging, and commitment (an affective component). Items include: “I have spent time trying to find out more about my ethnic group, such as its history, traditions, and customs”, “I have a clear sense of my ethnic background and what it means for me”, and “I have a strong attachment towards my own ethnic group”. Responses ranged from 1=Strongly Disagree to 4=Strongly Agree, and all 12 items were averaged, with higher scores indicating higher ethnic identity awareness.

Study 2 Participants

Data come from 39 undergraduate students attending a Human Sciences course in an Agriculture College at a large southern university in the United States. The majority of the sample identified as female (96%) and White (99%). Similar to Study 1, students were enrolled in a senior-level course that provides opportunities for students to gain awareness of their own cultures and families. Students participated in the study by providing responses to pre- and post-test assessment on the Intercultural Development Inventory (IDI), as well as their statements of reflections regarding the course. All students volunteered to participate and IRB was deemed exempt by the primary institution of data collection. At the end of the semester, students were debriefed on their IDI results with an IDI Qualified Administrator with individual coaching sessions on the IDI results and developing plans for the future to increase their competence.

Intercultural Development Inventory (IDI) assesses intercultural competence and has been used in more than 30 countries in corporate, non-profit, government, faith-based, and educational contexts (Hammer, 2015). The IDI is a 50-item questionnaire available online ($11/student; $15/nonstudent) that can be completed in 15–20 minutes and includes questions regarding intercultural experiences in terms of (a) their cross-cultural goals, (b) the challenges that they face navigating cultural differences, (c) intercultural incidents that they face when they encounter cultural differences, and (d) the ways they navigate those cultural differences. The IDI ranges from a score of 50 to 145 that individuals are scored on for their Developmental Orientation (DO), which was used for this study. DO indicates a student’s primary orientation toward cultural differences and commonalities along a continuum. The DO is the perspective that the student is most likely to use in situations where cultural differences and commonalities need to be bridged. Scores of 55 to 70 indicate Denial, 70 to 85 indicate Polarization, 85 to 115 indicate Minimization, 115 to 130 indicate Acceptance, and 130 to 145 indicate Adaptation.

In general, there are no guidelines on how to teach or what activities to include when teaching intercultural competence in higher education. There are general suggestions when developing curriculum in this topic, such as focusing on stereotypes, biases, and privilege. The main course assignment was created to mirror the Intercultural Development Plan (IDP), whereby participants set goals and choose activities that fit with their lifestyle. In the course, students were able to “choose their own adventure” where they chose what high-impact activities and assignments would help them increase their intercultural competence. These, based on ideas from the IDP, included analyzing media content (i.e., film, shows, music), writing a paper about a historical figure, reading a multicultural book, examining cultural issues in the news, visiting a museum on a diverse cultural group, reflecting on their own ethnic identity or family genealogy, as well as attending cultural and multicultural events (such as eating/cooking foods they had never tried before, attending lectures, talks, or heritage festivals). Each of these had points associated with the activity, with higher points indicating more time-intensive work. In addition, all students were required to reflect on their own stereotypes, privilege, implicit bias, as well as reflect on their experiences over the semester.

Results

Study 1

Overall, a t-test analysis (SPSS 25.0) showed a

significant increase in ethnic identity and belonging from the pre-and post-test surveys using the *MEIM*. When examining the full scale of *MEIM*, ethnic identity significantly increased over the course of the semester t(1,58) = -2.99, $p < .01$, with the average score changing from $M = 2.56$ ($SD = .45$) to $M = 2.91$ ($SD = .43$). When examining the two factors separately, only "affirmation, belonging, and commitment" increased significantly t(1,58) = -2.99, $p < .01$, from $M = 2.73$ (SD = .51) during the pre-test to $M = 3.10$ ($SD = .45$) at the post-test assessment. The sub-factor of "ethnic identity search" also increased, but not significantly ($M = 2.34$, $SD = .62$ vs. $M = 2.63$, $SD = .55$).

Study 2

Students were able to choose from a list of high-impact curriculum activities that fit best with their interests and goals for intercultural competence. Overall, a t-test analysis (SPSS 25.0) showed no significant change in the overall group mean for students' Development Orientation (DO) on the IDI assessment over the course of the semester (M = 86.63, SD = 13.58 to M = 88.05, SD = 15.41). Most students (49%), on average, were categorized as on the lower end of Minimization, which is an orientation that highlights cultural commonalities and universal values, but may mask deeper recognition and appreciation of cultural differences. For the other orientations, there were 18% in Denial, 26% in Polarization, 7% in Acceptance, and none in Adaptation.

Students were asked to reflect on their experiences in the semester based on the activities they participated in. Examples of students' written reflections included: "I never thought that I was living in a diverse community until taking this class. I usually see people equally, but when breaking down all the cultures and walking through campus, I began to realize that we indeed live in a diverse society". Another student wrote: "I am more grateful for this class because it has shown me a different side of myself. I usually do not branch out often and being able to interact with different cultures and experience events hands-on has made me a better person. I see the world differently, and I enjoy the way I see it a lot better. I am more aware of my surroundings, and I appreciate that this class has given me more confidence". Finally, one student wrote: "To live in a diverse society means that I acknowledge differences between people and celebrate them. I will not be colorblind, and I will try my best to delve myself into other people's cultures so that I can truly experience them. I realize that it was hard for me to understand other people's cultures, so I usually just ignored them and pretended we were all the same. While doing this, I was not intentionally being oppressive, but these actions were toxic because they diminished someone else's culture."

Discussion

Study 1 was created to help students learn about their ancestry, ethnic identity, and genealogy by utilizing an innovative method of Ancestry DNA that provided empirical data about their ethnic identity. Overall, there was a significant increase in ethnic identity over the course of the semester, and specifically students' affective feelings of affirmation, belonging, and commitment towards their identity increased. Thus, the overall project of including the DNA analysis and family history of genealogy was appropriate for this sample of primarily White undergraduate women to develop a better sense of their ethnic identity. Increasing ethnic identity among all students, especially those who identify as White, may enhance cultural sensitivity. Ancestry's DNA analysis may be a useful tool for increasing intercultural competence, which is the ability to shift one's cultural perspective to adapt to cultural commonality and differences. One of the first steps of intercultural competence includes self-awareness about one's own culture. This project, especially the technological piece of the ancestry's DNA analysis, is a potential way for individuals to develop a better sense of ethnic identity.

The ultimate goal of **Study 2** was to identify teaching tools and activities in and outside the classroom that substantially increases students' intercultural competence. Although there was not a significant increase in the IDI assessment over the course of the semester, students did participate in high-impact classroom activities related to intercultural competence, and from their written qualitative reflections, may have gained additional awareness and cultural sensitivity. Overall, most students scored in the Minimization orientation, which is common among most adults (IDI®). Hammer (1998) indicates that most people (65%) fall in the Minimization development orientation, whereas 3% are in Denial, 16% are in Polarization, 15% are in Acceptance, and 2% are in Adaptation. When students are in Minimization, they may focus too much on commonalities, while ignoring cultural differences and focusing on themes of "I do not see color" or "We are so similar". The goal for helping these students increase their Developmental Orientation is to help them understand concepts regarding power and privilege, as well as other differences between cultures so that they can move into the stage of Acceptance.

Limitations and Strengths

For both studies, the courses chosen were made up of primarily White undergraduate women, and thus future studies should continue identifying the impact of high-impact curriculum on intercultural competence for a more diverse sample of students. In addition, data was based on self-report single group pre- and post-test assessments, thus there may be testing effects and other potential biases in this sample; findings should be viewed with caution. A strength of both studies was utilizing course activities that helped students become more culturally aware. High-impact educational curriculum enabled these students to see the world and advance their agriculture and human sciences career development through learning about multiple perspectives, enhancing communication and interpersonal skills, modeling open mindedness, and appreciating diverse communities. The projects were guided by the goal of helping advance student success, strengthening the university's teaching with the creation of an innovative academic learning experience for students, and increasing intercultural awareness among students to create an

inclusive environment fostering a welcoming culture.

Teaching Implications

Starting with the classroom, it is important that all faculty create assignments that can be used to effectively improve students' intercultural competence. When the majority of White students mask their own cultural identity (Perry, 2001), it is important to foster their ethnic identity development, which can be done through Ancestry's DNA analysis or family genealogy. The current project identified classroom high-impact activities that may help students increase intercultural competency. These included students choosing whether to analyze media content (i.e., film, shows, music), write papers about historical figures, read multicultural books, examine cultural issues in the news, or attend multicultural events (i.e., eating/cooking foods they had never tried before, attending lectures, talks, or heritage festivals). It was also important that students reflect on their own stereotypes, privileges, implicit biases, as well as develop critical thinking skills to effectively engage with people and families from cultures different than their own. This can increase students' cultural sensitivity and a deeper sense of awareness about other cultures, which may ultimately help students move across the continuum from *Minimization* to *Acceptance* on the IDI.

Increasing intercultural competence is essential to higher education learning. Teaching, learning and collaborative fields all depend on successful communication, which starts with faculty and students. However, no course or discipline can cover all aspects of diversity, thus it is important that institutions of higher education systematically make changes in their curriculum, assessment, campus policies and environments, and with their personnel, including all sectors of higher education. Study abroad and international research opportunities are some of the best ways to increase intercultural competency (Williams, 2005). Additional resources should be provided to students (both undergraduate and graduate), faculty, and staff in order to increase their opportunities to engage in cultural interactions. As campuses continue to increase diversity, the need for intercultural competency is imperative for an inclusive, and non-discriminatory campus environment.

As our society becomes more interconnected and multicultural, it is imperative that we develop and assess intercultural competence among future leaders in Agriculture fields. Intercultural competency (i.e., focusing on race/ethnicity, language, and immigration) has been shown to increase communication, empathy towards understanding others, and creates a healthy environment where students learn to accept and respect differences (Taleisnik, 2017). Corporations and businesses are increasingly calling for the development of intercultural competence, and it is crucial that secondary education and agriculture fields demand it as well. Although often criticized as being resistant to change, education must be at the forefront of these initiatives (Cushner, 2012).

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Engaging Students in Global Agriculture: Three Authentic-Learning Classroom Interventions[1]

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Abstract

Today, an understanding and appreciation of the interconnectedness of global agriculture is a key component of agricultural economics curricula. However, without an authentic learning environment, it can be challenging for students to evaluate and comprehend the role of global agricultural subjects in a real-world context. In this paper, we examine three classroom interventions, each implemented in a different course, designed to improve students' understanding of and interest in global agriculture through an Authentic Learning model. The intervention/course combinations were a ten-week futures market trading simulation in a futures markets course, an international agribusiness case study in an agribusiness management course, and real-world example-based instruction in a course on the global food economy. The interventions varied by setting and by degree of authenticity in an Authentic Learning context. Our results show the three interventions led to increases in self-reported understanding of and interest in global agriculture.

Introduction

Agriculture students will become the next generation of agricultural practitioners; an understanding and appreciation of the interconnection of global agriculture will be imperative for their future success. However, studies have shown that students in colleges of agriculture lack knowledge in global agricultural practices, markets, policies, and culture (Mason et al., 1994; Morgan and King, 2013).

Within the agricultural economics curricula, global perspectives on agriculture arise naturally (Colyer, 1993; Lesch and Wachenheim, 2004; Mehlhorn et al., 2015). Topics of international trade, global agribusiness, and economic development are common parts of many agricultural economics' course syllabi. However, without an authentic learning environment, beyond textbook illustrations, it is difficult for students to evaluate and understand the role these global agricultural subjects have in a real-world context. Many students experience a disconnect between "real world" events and the topics discussed in agricultural curricula (Wingenbach et al., 2003).

It is common for students to search outside the classroom to learn authentically about global agriculture (Luo and

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Jamieson-Drake, 2015; Morgan and King, 2013; Niehaus and Inkelas, 2016). In particular, study abroad is popular. However, not all students can afford these opportunities (Briers et al., 2010; Chang et al., 2013; Raczkoski et al., 2018). Also, these practices suffer from limitations; Rice et al. (2014) identified that short-term study abroad courses may not have enough impact to develop enduring globally competent skills.

We seek to bring real-world authentic contexts to the classroom. Through an Authentic Learning (AL) model, we study three class interventions – a ten-week futures market trading simulation, an international agribusiness case study, and real-world example-based instruction. The objective of this study is to investigate whether well-designed classroom practices can effectively engage students in topics that students do not necessarily connect within their daily life, such as global agriculture. This can help formulate changes in teaching practices to increase student engagement, as well as to improve student learning and interest in global agriculture.

Theoretical Foundation

Authentic Learning (AL) provides the pedagogical framework for this study (Herrington and Oliver, 2000). AL is an instructional approach that situates learning activities within real-world circumstances, involving immersive learning tasks and realistic learning contexts. AL originates in the theory of situated cognition or situated learning (Brown et al., 1989), which argues that knowledge is situated and learning should not be abstracted from the situations where it is learned and used. Meaningful learning can only take place if it is embedded in the social and physical context within which it will be used. This "quest for authenticity" in education (e.g. Jonassen, 1991; Jonassen and Rohrer-Murphy, 1999) coincided in 1990s with a strong call for student centered learning, leading to AL pedagogy developments such as the use of simulations, cognitive apprenticeships, and problem-based learning frameworks (e.g. Bransford et al., 2013; Larmer et al., 2015; Strobel et al., 2013; Han et al., 2018).

Authentic Learning pedagogy is applied in both K-12 and higher education contexts (Newmann and Wehlage, 1993; Newmann et al. 1996). Herrington and Oliver's (2000) instructional design framework identifies nine elements to form a model of AL. The framework is applied in online environments (Oliver and Herrington, 2000) and in higher education contexts (Herrington and Herrington, 2006; Herrington et al., 2003). We summarized the nine elements of a AL model in Table 1 and applied them to measure the authenticity of the three interventions.

Students find AL activities stimulating and perceive AL tasks to be deeply relevant and highly contextual (Hung et al., 2004; Kearney, 2013; Kearney and Schuck, 2006; Stein et al., 2004). Further, in K-12 science education, underrepresented minority and female students are more engaged and thus learn more in AL activities, when compared with standard inquiry projects (Basu and Barton, 2007; Buxton, 2006; Murphy et al., 2006). In their review of 1,058 references on designs of authenticity in K-12 STEM curricula, Strobel et al. (2013) summarized seven key outcomes of AL, including higher disciplined inquiry, active self-knowledge construction, higher-order thinking, self-exploration, openness and diversity of forming and solving the problem, and the combination of personal interest, school goals, and professional goals. While research on authenticity and authentic practices is well-developed in STEM education, similar work in social science is still emerging. This study contributes to the discussion in the social science context, specifically in agricultural economics courses.

Three Classroom Interventions

Authenticity is a continuum. Learning environments and the associated tasks therein can be measured as more or less authentic given the characteristics in the AL framework (Herrington et al., 2014). In this study, we examine the authenticity level of each classroom intervention based on the nine elements of authentic learning proposed by Herrington and Oliver (2000). We refer to each authenticity element as "AL#" where # corresponds with the order that AL element appears in Table 1. Table 2 compares the three class interventions in the authenticity matrix. The three

Table 1. Elements of Authentic Learning (Herrington and Oliver, 2000; Herrington and Herrington, 2006)

1. Provide an authentic context that reflects the way the knowledge will be used in real life
2. Provide authentic activities that are ill-defined and present complex tasks to be completed over a sustained period of time
3. Provide access to expert performances and the modeling of processes that show how a real practitioner behaves in a real situation
4. Provide multiple roles and perspectives
5. Support collaborative construction of knowledge
6. Promote reflection to enable abstractions to be formed
7. Promote articulation to enable tacit knowledge to be made explicit
8. Provide coaching by the teacher at critical times, and scaffolding and fading of teacher support
9. Provide for authentic assessment of learning within the tasks

interventions were assessed by the authors as to which AL elements they exhibited. Description of each intervention and the determination of the presence of AL elements follows below. In Table 2, for each AL element, interventions that exhibited that element are marked with an X. We consider courses that exhibited more AL elements to be more authentic than those that exhibited fewer Al elements.

Intervention 1 - Futures Market Trading Simulation

The first intervention was conducted in AREC 313, "The Economics of Futures Markets." The course is designed for juniors and seniors, mostly economics and agricultural economics majors. The course topics examine the history and mechanics of futures markets, as well as the role of futures and options in speculative trading and hedging for risk management. Current events described in national and international newspapers are discussed each week to motivate an awareness of how government policy and natural events translate to changes in global commodity prices.

The intervention introduced in AREC 313 was a 10-week trading simulation on the StockTrak platform. The authors assessed that it exhibited seven out of the nine authentic elements as summarized in Table 2 and is considered to be the most authentic intervention among the three. In the intervention, students were provided an initial account with $500,000 of imaginary money and were required to make a number of transactions of different asset-class categories. These required transactions included making at least four commodity futures transactions, four foreign exchange futures transactions, four equity index transactions, and two transactions in options on futures contracts. Students traded in an authentic context (AL1); the system resembled the mechanics of actual trading software and executed transactions based on real-time prices. Although prices were slightly delayed, the task was otherwise representative of the real-world trading experience.

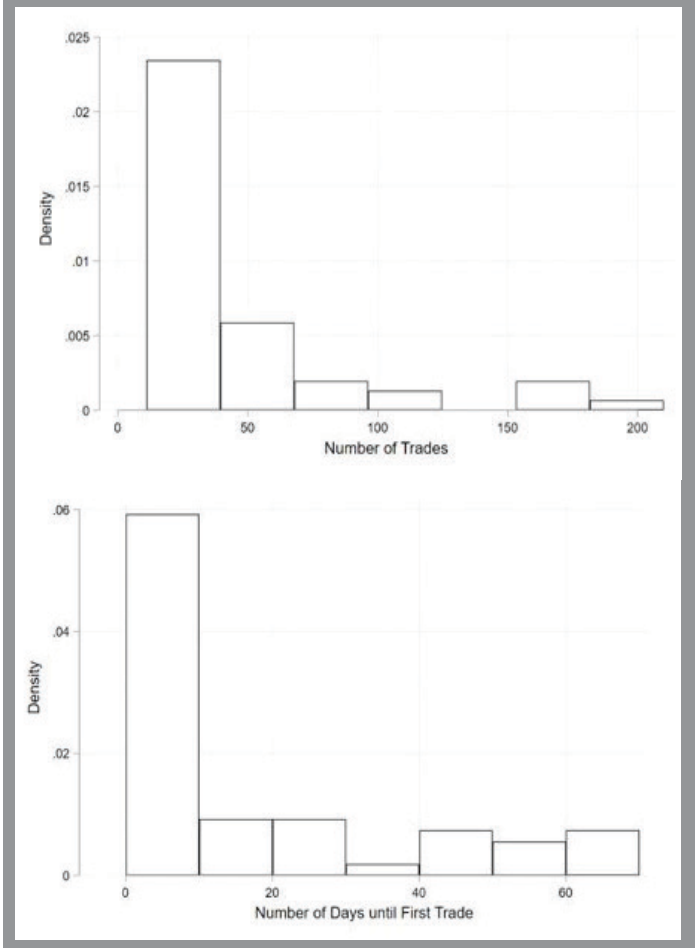
The classroom itself also provided an AL environment. During classes, students viewed video clips of professional traders discussing current potential trades and their decision-making process allowing for access to experts (AL3). Students were provided initial guidance on what transactions to make with support fading as the simulation progressed (AL8). Overall, the simulation grade was based on two components: (1) completion of the required number and types of futures and options transactions, and (2) a three-page reflection essay (AL6) which detailed their trading experience and identified how concepts learned in class manifested in their trading experience (AL7). In addition to the simulation grade, the student who earned the greatest trading profits over the course of the simulation was awarded a prize. This profit incentive provided an authentic earning context (AL2). Additionally, students were asked to specifically identify any events that affected the price of a commodity on which they had an open position and to cite news articles detailing the event. The objective was to encourage students to connect how international policy changes, trade barriers, or weather events can affect global commodity prices, building an understanding of the connectedness of global agriculture and international trade (AL9).

Student engagement in the activity, as measured by frequency of trades, delay until first trade, and trading performance, varied considerably among the students. Students were required to make 14 trades to complete the assignment and the simulation platform allowed for a maximum of 250 trades. Figure 1 presents histograms for these activities, demonstrating the spread of interactions with the activity. On average, students transacted 45 times during the simulation with a minimum of 11 and a maximum of 210 transactions. The average delay to the first trade was 17 days, although some students traded on the first day (day 0) and some traded for the first time on the 70th day (which was the final day of the 10-week trading simulation).

Table 2. Course/Intervention Authenticity Matrix

Authenticity Element	AREC 313 Futures Market Trading Simulation	AREC 315 International Agribusiness Case Study	AREC 150C Real-world Example-based Instruction
1. Authentic Context	X	X	
2. Authentic Activities	X		
3. Expert Performances	X		
4. Multiple Roles and Perspectives			
5. Collaborative Construction of Knowledge		X	X
6. Reflection to Enable Abstraction	X	X	X
7. Articulation	X	X	X
8. Coaching	X	X	
9. Authentic Assessment	X	X	

Figure 1: Trading Simulation Engagement



Top Panel: number of transactions executed; Bottom Panel: delay to first trade

Intervention 2 – International Agribusiness Case Study

The second intervention was conducted in AREC 315, "Agribusiness Economics and Management," a course designed to equip students with the economic intuition and analytical skills demanded in global business management. Students from both animal or veterinary sciences and agribusiness management majors enroll in this course. Case studies have been incorporated to connect economic and management principles with real-world happenings. Specifically, one particular case study on a multinational retail chain was used in the module discussing international agribusiness; this case study is the intervention for this course.

The authors assessed that this case study intervention exhibited six authentic elements as presented in Table 2, representing the mid-point of authenticity in this study. The information and data in the case study of interest provided an authentic context that demonstrated various entry modes to global markets used in a real multinational corporation (AL1). Students used the case narrative to connect management principles with their real-world applications. The case study also supported collaborative construction of knowledge (AL5): in a 50-minute case session, students first worked collaboratively in groups on the case questions; then all groups were invited to contribute to a class worksheet and share their thoughts through class discussions. The interactions among the class allowed students to reflect with peers and the instructor (AL6). The class discussions promoted dialogue, enabling implicit knowledge to be made explicit (AL7). The instructor's coaching role in the case session was also consistent with AL (AL8). Ultimately, the case study was assessed on both the written summary and class contributions by groups, which were integrated within tasks, and thus provided authentic assessment of learning (AL9).

Attendance in case study sections can be used as a proxy of student engagement. We compare average attendance of usual lecture sections with the five case sections in Table 3. Sixty-five students were enrolled in the course. All five case study sections were held on a Friday. In general, students showed higher attendance in case sections than normal lecture meetings, with the first case serving as an exception. It took place the Friday before the Labor Day long weekend, which may explain the lower attendance. Attendance in all class meetings had grade incentives, but the case section participation counted for a greater percentage towards the final grade. Both the grade and the interest in cases may contribute to engagement in the case section meetings.

Intervention 3 – Real-world Example-based Instruction

The third intervention was conducted in a general education course on the global food economy, AREC 150, "The Global Economy of Food: Sustaining Life." The objective of the course is to equip students with an understanding and appreciation of the players, trends, policies, and controversies of the global food system. The class is designed for freshman students with no agriculture and no economics background.

Table 3 Average Attendance Comparison in AREC 315: Lectures vs. Case Studies[z]

Case	Class periods	Lecture sections	Case section(s)
1	Before Exam 1	59	52
2	Between Exam 1 to 2	55	59
3	Between Exam 2 to 3	53	57
4	Between Exam 3 to 4	48	64

[z]There were 65 students enrolled in AREC 315 in the study semester; the attendance number are presented in the table for comparison.

The intervention of interest in AREC 150 is the real-world example-based instruction. The authors accessed this intervention with the lowest level of AL in this study, with three authentic elements presented following Table 2. In addition to real-world examples used in instruction, the course included some other AL opportunities: in particular, students were expected to collaborate, reflect, and articulate

their learning, through assignments, team projects, and group discussions. Students were split into teams, with whom they convened during each class meeting, to discuss readings and the daily lecture (AL5). Students were also, in these groups, required to reflect on questions to which they might not necessarily know the answer – though often have the tools to find the solution – through collaboration and discussion (AL6). They were regularly required to describe and articulate how they achieved the solution or answer what they found (AL7). Though the intervention represents a learning environment with the lowest number of authentic learning elements, relative to the other two interventions in this study, it is an environment which remains common across university classrooms, given the prevalence of chalk-and-talk in the university classroom (Goffe and Kauper, 2014; Watts and Becker, 2008; Watts and Schaur, 2011).

We consider regular class attendance as a proxy for engagement with the intervention. Approximately 80% of students regularly attended class, according to instructor records. This suggests high engagement with the course generally, particularly as estimates of absenteeism range from 18.5% to as much as 70% (Crede et al., 2010).

Materials and Methods

The purpose of this study is to assess the effectiveness of the three classroom interventions guided by the Authentic Learning model, specifically investigating students' understanding of and interest in the global agriculture. Teaching practices can be evaluated effectively using self-evaluations, classroom evaluations, and students' performance (Fraenkel et al., 2011). In this study, we obtained measures from both students' self-evaluation and student grades on exam questions related to the global agriculture intervention. The University of Arizona Institutional Review Board approved the study protocol and all participants provided written informed consent prior to participation in the study.

The population of interest (N=310) included students enrolled in the three courses. The three courses were taught by three different junior instructors at the same university, in the same department, and during the same semester in Fall 2018. The study population was approached so that informed consent could be obtained. Students had the opportunity to read general information about the intended study information and offer their consent. The study presented minimal risk to participants, with loss of confidentiality as the main risk associated with participation. However, the probability of experiencing a loss of confidentiality was minimized by de-identifying all data used in the analysis. Students exercised their right to opt-out of the study, which reduced the sample (N=182). Potential systematic opt-out behavior could lead to sample selection bias in the study.

Previous work on undergraduates' knowledge and attitudes about global agriculture were considered in creating our survey instrument (Chang et al., 2013; Mason et al., 1994; Wingenbach et al., 2003). We asked two questions, related to understanding of and interest in global agriculture, as our metric of interest in evaluating the impact of the class interventions:

1. Q1 - Does [the class intervention] improve my understanding of [the topic and] global agriculture?
2. Q2 - Does [the class intervention] inspire my interest in [the topic and] global agriculture?

Students responded on a Likert scale, with five options, ranging from "strongly disagree" to "strongly agree". The specific survey questions varied based on the class interventions in the course. The cross-sectional survey collected data from the three courses at about the same time in classroom environments (Fraenkel et al., 2011).

Only post-intervention data were collected for this study. As such, we do not attempt to establish causality between the interventions of interest and student learning (Fraenkel et al., 2011). Instead, we examined the correlations and general relationships that the interventions had with student-reported understanding of and interest in global agriculture. We used t-test and rank-order Mann-Whitney test (Fay and Proschan, 2010) to identify mean and distribution differences in student responses across the three interventions.

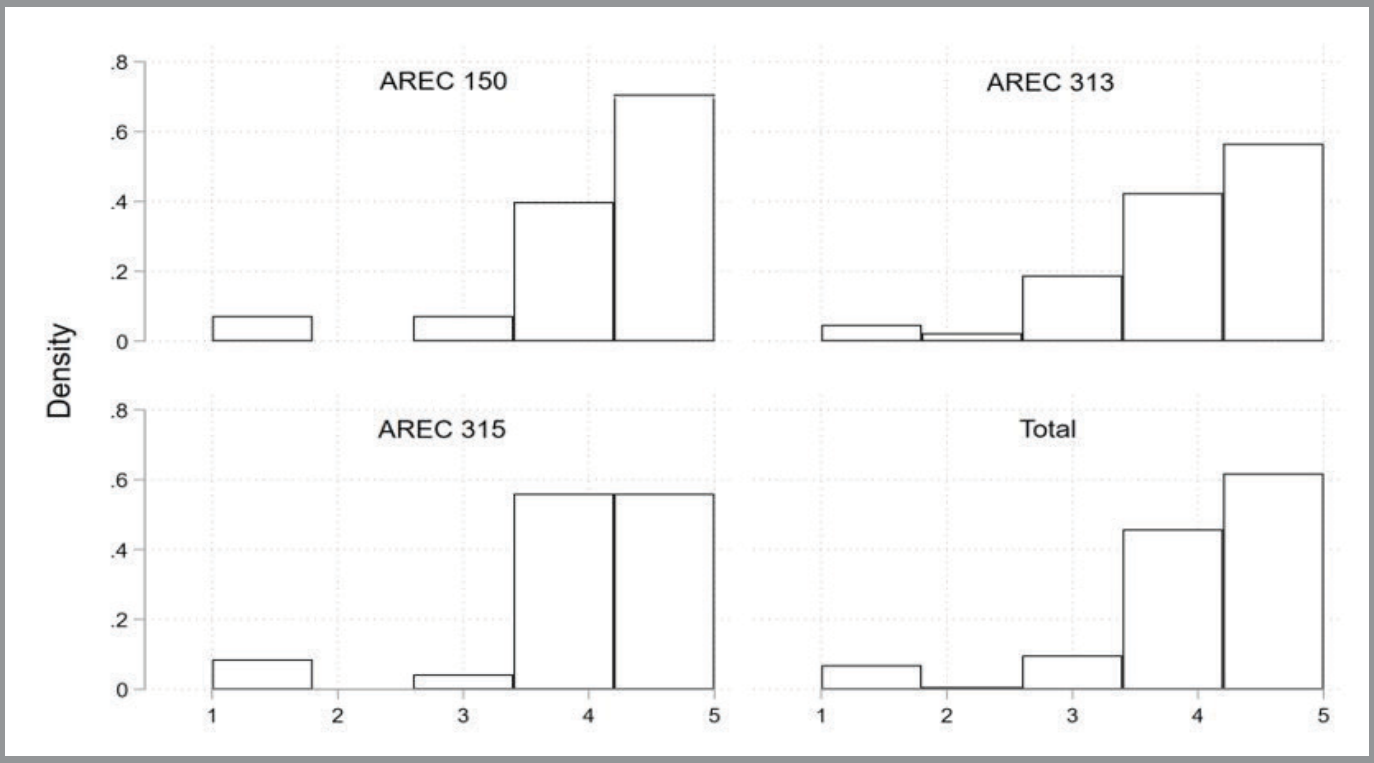
Results and Discussion

Participants (N = 182) consisted of mostly upper-classmen, 59.3% (Table 4), largely from enrollment in AREC 313 (50 students, 92.6%) and AREC 315 (53 students, 91.4%). Enrollment in AREC150 was a majority freshman (49 students, 70.0%). Overall, most students enrolled (64.8%) were either economics or agricultural economics students (Table 4), though this was again driven by enrollment in AREC 313 (53 students, 98.2%) and AREC 315 (37 students, 63.8%). Table 4 provides additional details on the characteristics of the sample population, with respect to class standings and major.

Based on student responses to Q1 and Q2, students reported increased understanding (Q1) and interest in (Q2) the topic and in global agriculture broadly. More than 86% of students responded "agree" or "strongly agree" to the question that their understanding of the intervention and global agriculture increased as a result of the intervention. Similarly, more than 66% of students responded "agree" or "strongly agree" to the question that their interest in global agriculture increased as a result of the intervention. These findings generally follow Newmann and Wehlage (1993) and Newmann et al. (1996) who observed a strong positive correlation between the interventions and outcomes in AL contexts. These findings also echo Lugar and Stewart (2019) and Splan et al. (2016) who found increased interest and understanding, according to student respondents, following experiential and active learning classroom interventions.

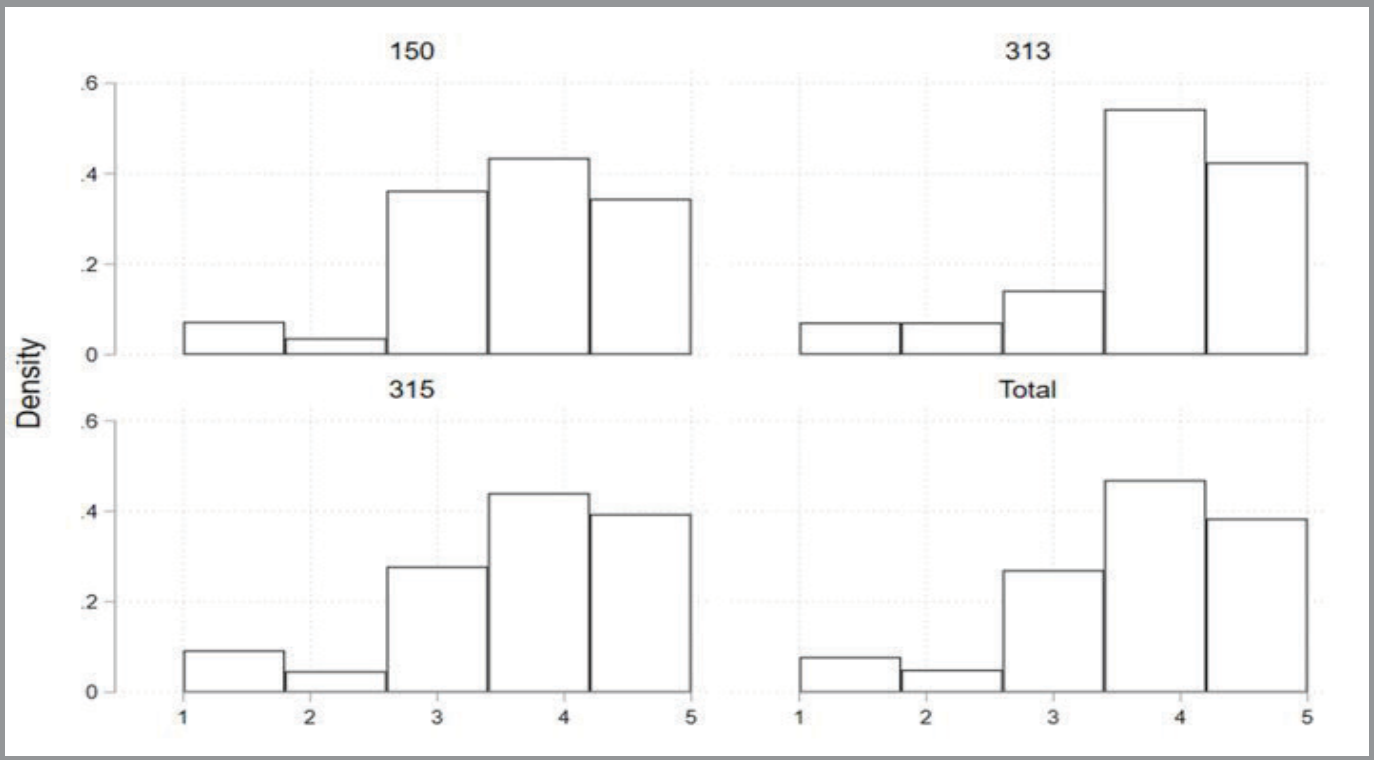
With the large number of students who responded positively to the questions of interest, we observed response pooling in the upper end of the distribution, demonstrated in Figure 2 and Figure 3. We investigated this pooling to determine if distributions were statistically different within courses (comparing Q1 and Q2) and for the same question (Q1 or Q2) across courses (e.g. comparing AREC 313 with

Figure 2: Student Responses to "intervention increased understanding" Question



Note: 1 indicates "strongly disagree" and 5 indicates "strongly agree."

Figure 3: Student Responses to "intervention increased interest" Question



Note: 1 indicates "strongly disagree" and 5 indicates "strongly agree."

Table 4. Summary of Sample Characteristics[z]

	AREC 313	AREC 315	AREC 150	Total
Sample size	54	58	70	182
Freshman	0 (0%)	0 (0.0%)	49 (70.0%)	49 (26.9%)
Sophomore	4 (7.4%)	5 (8.6%)	16 (22.9%)	25 (13.7%)
Junior	23 (42.6%)	24 (41.4%)	2 (2.9%)	49 (26.9%)
Senior	27 (50.0%)	29 (50.0%)	3 (4.3%)	59 (32.4%)
Econ / AREC Major	53 (98.2%)	37 (63.8%)	28 (40.0%)	118 (64.8%)

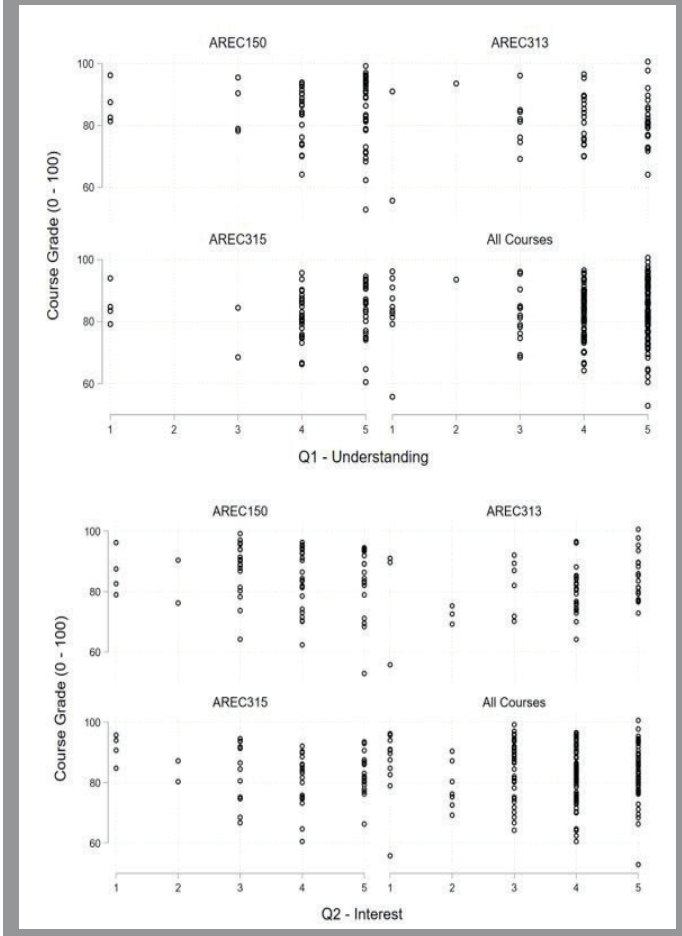
[z]The number of observations is presented in the table by course and in total; the percentage frequencies are reported in parenthesis.

AREC 150, AREC 315, and the combination of the two other courses). We found no statistically significant difference in the distributions, using a Mann-Whitney test. It is likely that more senior students in AREC 313 and 315 were more familiar with basic concepts and practices, and thus less likely to view the learning environment as increasing their understanding and appreciation relative to a first-semester freshman student in AREC 150, regardless the authenticity level of the interventions.

Because of this higher-end distribution pooling, regression analysis did not identify significant relationships, when considering performance in courses overall, on exams, or responses to particular survey questions. Figure 4 presents the distribution of overall course grades, and the corresponding responses to the understanding and interest questions. Investigations of these distributions, by grades, reveals no significant differences. This result suggests that students are not responding positively due to receiving higher grades. Instead, responses on the Likert scale are varied across the grade distribution.

It is important to acknowledge that some of these findings may be driven by bias resulting from sample selection, as we were only able to evaluate (1) the students who enrolled in the courses in which the interventions occurred and (2) the students who consented to have their data used in the study. In the case of AREC 313 and AREC 315, students likely were enrolled in the agricultural economics or economics majors and had an interest in the subject. In the case of AREC 150, the freshman students enrolled were initially randomly assigned through a university enrollment process for general education courses. However, the students who remained in the course, as well as upperclassmen enrollees, were more likely to be individuals interested in food, agriculture, and global agricultural systems. Further, it is certainly likely that higher grade level students begin a course with an already substantial understanding of and interest in global agriculture compared to their more junior peers as a result of learning and experience in their other classes. In future work, we hope to assess students' understanding and appreciation of global agriculture before and after interventions to obtain more precise information on the effectiveness of different interventions in different contexts. Presently, our results can be viewed similar to those of Greene (1992); although they are not necessarily representative of other populations or settings, the ideas can be applied to contexts.

Figure 4: Mean Overall Course Grade by Student Responses



Notes: Panel above: responses to "intervention increased understanding" question
Panel below: responses to "intervention increased interest" question
(1 indicates "strongly disagree" and 5 indicates "strongly agree")

Summary

Knowledge of global agriculture is crucial for the next generation of agricultural practitioners. To conduct business in responsive and adaptable ways, future participants need to be aware of potential sources of change, whether they are nearby or in far-flung corners of the world. However, research has indicated that students lack knowledge in global agricultural practices, markets, policies, and culture (Mason et al., 1994; Morgan and King, 2013) and are disconnected between the topics presented in class and the "real world" (Wingenbach et al., 2003).

In this study, we examined efforts to bring real-world authentic contexts to the classroom. Based on student responses, we found that regardless of level of authenticity of the intervention, students reported an increasing understanding of and interest in global agriculture. While some limitations existed, including using only post-intervention data, sample selection bias, and associated non-random sample (Fraenkel et al., 2011), we concluded the interventions were associated with increases in self-reported measures of interest in and understanding of global agriculture. These results aligned with previous literature, including Lugar and Stewart (2019), Newmann and Wehlage (1993), Newmann et al. (1996), and Splan et al. (2016).

These findings serve as a preliminary foundation for further investigation into the authentic and experiential learning environment, within the courses of interest. Future research should assess students' understanding and appreciation of global agriculture using pre- and post-intervention evaluations to obtain precise information on the effectiveness of interventions in different contexts, and work to establish causality for the interventions of study. This research can be used to inform teaching practices, to increase student engagement, improve student learning, and generate student interest in agriculture.

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Faculty Motivations for Leading Short-Term Study Abroad Courses

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Abstract

This case study explored the motivations faculty in the College of Agricultural Sciences and Natural Resources at Oklahoma State University have for developing and leading short-term study abroad courses or experiences. Data were collected through semi-structured interviews and document reviews. Individual interviews were conducted after faculty had led a study abroad trip. The interviews explored faculty reflections on the outcomes of the experience. The documents reviewed included course syllabi, curriculum vitae, and the university's international strategic plan. Previous experiences, student inspirations, and pre-existing structures were the three themes that emerged from personal interviews regarding faculty's motivation for developing study abroad courses. Specifically, faculty were motivated to provide students with international human capital and to network and build connections.

Introduction

A need exists to globalize and internationalize undergraduate curriculum at U.S. institutions of higher education (Bartell, 2003). As global economies and societies become increasingly interdependent, graduates and organizations in the food, agriculture, natural resources, and related sciences must be prepared (Andreasen, 2003; Harder et al., 2012; Lamm and Harder, 2010; Roberts et al., 2016; National Research Council [NRC], 2009). Colleges of agriculture across the U.S. have been challenged to provide an internationalized curriculum that prepares students for employment in the global food and agriculture marketplace after graduation (National Research Council, 2009). The NRC's mission to achieve this goal is twofold: 1) increase international experiences for students, and 2) integrate international content into on-campus curriculum (Harder et al., 2012). However, to accomplish the task of internationalizing the curriculum, it is imperative that universities "internationalize the faculty" who work at them (Dooley and Rouse, 2009, p. 48).

Kuh (2008) identified diversity and global learning as an example of a high-impact activity that could sharpen students' critical thinking abilities. High impact learning experiences are considered one way to prepare university graduates for employment (Murphrey et al., 2016). High impact learning experiences in the fields of agriculture encourage students to "purposefully and systematically . . . create new knowledge, make connections across curriculum, explore opinions/views/perspectives beyond their own, and engage in critical thinking" (Murphrey et al., 2016, p. 162). Future graduates of university agriculture programs need to demonstrate a high level of global competence (Platt, 2004). These needs can be met in a number of ways, such as students' participation in study abroad programs (Roberts et al., 2016). Scholars believe international experiences, such as study abroad, help students develop such skills (Bruening and Shao, 2005). However, the vital role faculty play in developing and facilitating such experiences must not be lost in this discussion.

Although study abroad programs have varied in length over the past 25 years, "skepticism has been voiced about whether the increasingly popular short-term study abroad format can offer students a sufficiently profound experience to transform the fundamental values and beliefs that underlie global citizenship" (Tarrant et al., 2013, p. 6). Harder et al. (2012) identified college faculty as a key factor in the pursuit

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of internationalizing content in on-campus courses, and concluded faculty must be globally competent if they are to participate actively in the internationalization process. To this end, college faculty are expected to acquire international experience to globalize educational experiences for students (Gouldthorpe et al., 2012). However, various challenges make opportunities for faculty to participate in international experiences difficult (Moseley, 2009). Overcoming barriers to global competence requires faculty to be sufficiently motivated. Professional development opportunities allow faculty to increase their skills at teaching abroad (Gouldthorpe et al., 2012; Roberts et al., 2016). For students, faculty-led international experiences are the most popular option for students looking to increase their global competence and awareness (Bunch et al., 2013; Ludwig and McGirr, 2003; Zhai and Scheer, 2002).

Faculty motivation to internationalize their curriculum is most likely impacted by former, personal international experiences. Those who lead study abroad courses must be able "to deliver international pedagogy that develops students with an understanding of the cultural, social, economic, and political systems throughout the world" (Sjoberg and Shabalina, 2010, p. 46). Planning, developing, and leading a study abroad course is a time consuming task (Koernig, 2007) and, due to their heavy workload pressures and expectations, one that should be considered carefully for those who are untenured (Dooley et al., 2008). Expectations for leading a study abroad course can by heavy. Some faculty are expected to become bilingual prior to facilitating their study abroad experience (Sjoberg and Shabalina, 2010). Therefore, what is the motivation for a faculty member to conduct a short-term study abroad experience? Research is needed to determine why faculty teach the way they do (Sandgren et al., 1999), especially as it relates to their motivation to lead study abroad experiences (Harder et al., 2012).

Theoretical Framework

Motivation to lead an international experience, such as a study abroad program, from an expectancy-value perspective, results from the alignment of expectancies for success, subjective task values, and perceived costs of participation. We identified expectancy-value theory (EVT) as the most appropriate theoretical lens for understanding and describing how faculty in the College of Agricultural Sciences and Natural Resources at Oklahoma State University experienced motivation to facilitate international learning experiences for students. Modern EVT is grounded in the seminal work of Atkinson (1964), linking achievement behaviors, persistence, and choice to individuals' expectancy- and ability-related beliefs and subjective-task value beliefs (Eccles and Wigfield, 2002). Modern expectancy-value theory includes a broad array of determinants, including the psychological, social, and cultural aspects of individuals' choices to engage in tasks. Eccles et al. (1983) operationalized expectancies for success as individuals' beliefs regarding future performance on an upcoming task, which are measured in manners analogous to Bandura's (1997) self-expectations for success.

Expectancies for success are ability-related beliefs regarding personal capabilities in the context of performing a task successfully. In colloquial terms, expectancies answer the question, Can I successfully lead a short-term study abroad course? (Schunk et al., 2013). Values pertain to individuals' perceptions about why they might choose to engage in a task. For the purpose of this study, values answer the question, Do I want to lead a short-term study abroad course, and why? (Schunk et al., 2013). Subjective-task value is a universal construct defined by four distinct domains: attainment value, intrinsic value, utility value, and cost (Eccles et al., 1983). Attainment value is operationalized as the personal importance of succeeding on a task as well as explaining the reason one engages in a task. Individuals use this value to confirm or demonstrate aspects of personal ideals of self-schemata, such as masculinity and femininity (i.e., the opportunity to demonstrate competence in a certain domain or task). Individuals hold higher attainment values for activities to the extent they can demonstrate or confirm positive aspects of those schemata (Eccles and Wigfield, 2002). Intrinsic values are the enjoyment of activity participation and interest in the activity or task. Utility values relate to a person's future goals, and relative cost relates to the negative aspects of task engagement (Eccles and Wigfield, 2002). Cost has been recognized as a new dimension to expectancy-value models and can impact whether or not a person chooses to participate in a task (Barron and Hulleman, 2014; Flake et al., 2015).

Context and Overview

In 2015, Oklahoma State University (OSU) set a goal of having one-half of all undergraduate students participate in an international experience prior to being graduated. In addition, this plan seeks to recognize and promote internationalism of students, faculty, and staff and increase international capabilities of faculty and staff. International experiences offered to students at OSU vary from short-term, faculty-led programs to semester and academic year programs (reciprocal exchange). The university believes there is transformational power in having an internationalized campus, including the benefits that it can provide to the scholars residing there (International Strategic Plan, 2015). Part of the plan requires OSU employees to be rewarded for their international efforts and supported by programs to understand better the university's international strategic mission.

Purpose

The purpose of this case study was to investigate the motivations of college faculty at Oklahoma State University in the College of Agricultural Science and Natural Resources to lead a study abroad experience. Specifically, this study sought to answer the following research question: What motivates faculty members at a land-grant university to develop and lead a short-term study abroad course or experience?

Materials and Methods

A qualitative, case-study design was selected because it is suited best for controlling researcher bias and isolating the phenomenon under investigation. In case-study research, the researcher attempts to gain access to the lived experiences of a phenomenon (Stake, 1995). The dearth of information in the literature regarding faculty motivations to lead international experiences provided the impetus for exploring the how and the why. It is only through their lived experiences that the story can begin to be unfolded. To accomplish this, a qualitative approach (Patton, 2015) was used to understand better the motivations agricultural faculty assign to their shared experiences of leading short-term study abroad courses or experiences.

We used criterion-based sampling to identify participants for the study. Criterion-based sampling involves selecting participants based on pre-determined metrics of importance (Patton, 2015). The following criteria were used: 1) participants must be faculty members in the College of Agricultural Sciences and Natural Resources at Oklahoma State University, 2) the teaching experiences of the faculty must include a short-term, study abroad course or experience, and 3) participants must be willing to engage in the interview process, including follow-up interviews.

Potential participants were located through the university directory of colleges with short-term study abroad courses or experiences. The frame was cross-referenced with a list of participants from the College of Agricultural Sciences and Natural Resources at Oklahoma State University. Four faculty were identified who met the established criteria. Researchers contacted faculty directly through email. Participants agreed to be interviewed face-to-face in an open-ended interview using a researcher-designed protocol at the participants' university offices. The overall intent of the interview protocol was to be flexible and emergent (Patton, 2015). However, in general, participants were asked to 1) provide an overview of their academic background; 2) discuss the development of their study abroad course, such as how they developed it, how they chose their destination, and how they established their contacts and experiences; 3) explain how they became aware of the opportunity to lead short-term study abroad courses; 4) discuss their personal and professional motivations for leading a study abroad experience; 5) reflect on what they hope students gain from the experience, and 6) to offer policy recommendations for the university's study abroad office. The duration of the interviews ranged from 44 to 55 minutes.

Interviews were transcribed verbatim and analyzed using the constant comparative method. The constant comparative method seeks to identify linkages within the data to identify patterns and themes (Merriam, 1998). Pseudonyms were assigned to the participants to protect their individual identity. The results of the study were grouped by the study's research question and broken down by emergent theme and sub-themes (Lincoln and Guba, 1985). As researchers, we served as the instruments for the study (Guba and Lincoln, 1989) and as such met weekly to discuss the interviews and analysis. In addition to the interviews, faculty agreed to provide us with a copy of their course syllabi and curriculum vitae as a means for triangulating the data. As such, member checking and triangulation were used to increase the internal validity and reliability of the study (Lincoln and Guba, 1985; Merriam, 1998). An audit trail was established to ensure the study's dependability and credibility (Trochim, 2006). Confirmability was established during the coding process as data were analyzed line-by-line, and themes were developed regarding repetitive words, statements, and phrases (Patton, 2015). Finally, peer examination and detailed accounts of participant experiences were used to increase the trustworthiness and credibility of the inquiries.

A critical element in conducting qualitative research is to acknowledge the bias that individual researchers have toward the phenomenon, which ultimately can affect the interpretations of the study. As such, we offer the following reflexivity statement to describe our bias and interest in the topic (Lincoln and Guba, 1985). At the time of the study, the first researcher was a third-year Ph.D. student in Agricultural Education. He is a Returned Peace Corps Volunteer, and lived abroad for three years. His research focuses on human motivation and the role perceived cost plays in decision-making in agricultural and natural resource settings. The second researcher is a professor of Agricultural Education. He has made several trips abroad where he has led professional development sessions to local agriculturists on best practices related to raising goats and conservation farming. His research is underpinned in human capital and motivation. Based on these experiences, we recognize our influence on the study's findings; however, measures were taken to lessen our bias when interpreting the data and drawing conclusions.

Participants

The population of this study consisted of all faculty (N = 4) in the College of Agricultural Sciences and Natural Resources at Oklahoma State University who led a study abroad experience in 2016. Of the four professors, one was female and three were males. A description of each participant's personal and professional profile is included below.

Dr. Talley is a professor in agricultural education at Oklahoma State University. He has been recognized and awarded as an outstanding teacher multiple times at the university, regional, and national levels by his peers. At a former university, Dr. Talley was awarded the institution's highest teaching honor possible. As a teacher educator, his research fits within the scholarship of teaching and learning. He serves on numerous teaching-related committees at the college level and prides himself on being an excellent teacher. At his former institution, Dr. Talley was on a 100% teaching appointment, and even now that he serves as an administrator, he continues to teach and advise graduate and undergraduate students. He has led a study abroad course to Europe for the past eight years.

Dr. Lee is an assistant professor in horticulture at Oklahoma State University. She is employed on an 80% teaching and 20% extension appointment. A native of China, Dr. Lee appreciates the expertise her home country

offers regarding landscape design and architecture. Prior to entering the professoriate, Dr. Lee worked in the landscape design industry in China for 17 years. In addition to teaching, she delivers numerous extension programs each year to adults and youth alike. As listed in her curriculum vitae, 67% of her peer-reviewed research publications include pedagogy and motivation in the titles, indicating further her desire to be an effective teaching scholar.

Dr. Kutcher is a professor in forestry in the College of Agricultural Sciences and Natural Resources at Oklahoma State University. He is employed on a 100% teaching appointment. Per his curriculum vitae, he has received 17 college wide and university awards related to his teaching, including but not limited to, the College's Teaching Excellence Award, the University Regents Distinguished Teaching Award, and the Faculty Excellence Award in International Studies. Additionally, he has been recognized as a Fellow in his discipline's professional association. Dr. Kutcher served as his department's undergraduate curriculum coordinator for 13 years and actively advises undergraduate students. He teaches eight courses and coordinates two three-week international field camps each year.

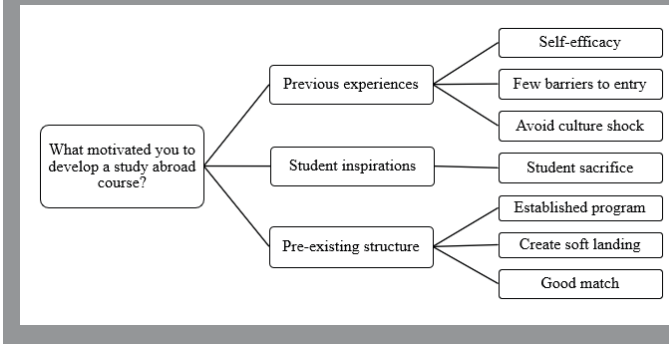
Dr. Schuster is a social scientist in the College of Agricultural Sciences and Natural Resources at Oklahoma State University. He is employed on a 100% teaching appointment where he teaches undergraduate students about economics principles and finance. Per his curriculum vitae, he has been recognized with seven teaching and eight advising awards during his tenure. Dr. Schuster has served on numerous college- and university-wide committees, including being a representative for the General Education Committee for the College of Agricultural Sciences and Natural Resources, the Agricultural Faculty Council, and the Academic Standards Committee.

Results and Discussion

The first part of objective one dealt with what motivated faculty to develop a study abroad course. Through our analysis of the data, four themes and seven subthemes emerged: previous experiences, student inspirations, and pre-existing structure. Emergent themes and sub-themes regarding faculty's motivation to develop study abroad courses have been highlighted in Figure 1, and descriptions of the themes and subthemes follow in the text below.Dr. Talley is a professor in agricultural education at Oklahoma State University. He has been recognized and awarded as an outstanding teacher multiple times at the university, regional, and national levels by his peers. At a former university, Dr. Talley was awarded the institution's highest teaching honor possible. As a teacher educator, his research fits within the scholarship of teaching and learning. He serves on numerous teaching-related committees at the college level and prides himself on being an excellent teacher. At his former institution, Dr. Talley was on a 100% teaching appointment, and even now that he serves as an administrator, he continues to teach and advise graduate and undergraduate students. He has led a study abroad course to Europe for the past eight years.

Dr. Lee is an assistant professor in horticulture at Oklahoma State University. She is employed on an 80% teaching and 20% extension appointment. A native of China, Dr. Lee appreciates the expertise her home country

Figure 1. Themes and subthemes emerging from participants' responses to a question about their initial motivations for developing a study abroad course.



Theme 1: Previous Experiences

Dr. Talley framed initial motivations for leading short-term study abroad courses with comparisons to previous international experiences, as a form of confidence-building. He qualified these statements with the phrase, "I had no idea what I was getting into at first." He also compared topics such as challenges, culture shock, and language barriers to what he perceived would "build confidence." Overall, Dr. Talley believed the language barriers and culture of the Czech Republic would be a good fit for "kids who hadn't studied abroad before or didn't have any previous international experience." Dr. Kutchar admitted that developing a study abroad course was nowhere on his radar when he first entered the professoriate. In fact, when he began his tenure, there were only a few faculty involved in study abroad. Yet, he was able to build his confidence only after he made his first trip to Honduras alone to survey the landscape. On returning, he was convinced to "make this work somehow" and became an early pioneer for developing a study abroad course. Dr. Lee hinted that her confidence in developing a study abroad course to China stemmed from her frequent international travel back and forth from the US to China, her home country.

Theme 2: Student Inspirations

Faculty were motivated to develop their study abroad courses because of specific students who inspired them to do so. Dr. Kutcher stated that 27 years ago two students from Honduras knocked on his door and introduced themselves to him. They both had technical degrees from Honduras and were at Oklahoma State University on a grant-funded program with the hope of becoming foresters and returning to Honduras after receiving their degrees. At the end of their academic careers, they invited Dr. Kutcher to their homeland to visit them. Their persistence prevailed as they continued to handwrite him personal invitation letters each month until he finally agreed to travel to Honduras to meet up with them. As a result of that invitation and persistence, a study abroad course emerged, and he took his first cohort

of students to Honduras in 1999.

Dr. Lee shared a similar story about being "moved" by one of her students. The student was adamant that he attend. Although he had never taken out a loan to pay for any part of his education, he was willing to do so to participate in her study abroad course. He perceived it to be a "once in a lifetime opportunity." Because of this student's persistence and willingness to sacrifice by going into financial debt, Dr. Lee was "determined" to develop the course.

Theme 3: Pre-existing Structure

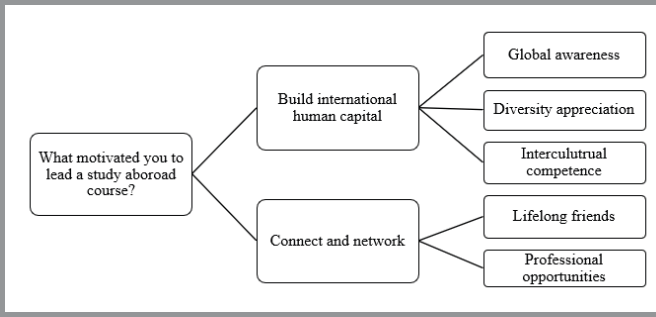
Being able to benefit from an established program with a pre-existing structure also was a motivation for faculty (see Figure 1). Dr. Schuster stated that he was the beneficiary of a study abroad experience that had been delivered by another faculty member before him. In fact, he admitted that although he and his colleague co-developed the syllabus, it was his colleague who had been the one to travel and deliver the course. Toward the end of his colleague's tenure and pending retirement, he invited Dr. Schuster to accompany him on his last trip to get a lay of the land and receive mentorship. During that trip, Dr. Schuster met contacts, observed his colleague teach the course, and surveyed the sights necessary for leading the course in the future.

Dr. Lee told a similar story of how when she was hired the person who preceded her was known as the study abroad faculty member in her department. She stated that once the faculty member retired, the study abroad experiences ceased altogether in her department. After "four or five years" of dormancy, Dr. Lee was encouraged by a colleague to consider reviving the experience for students. She admitted, "It (study abroad experience) was just nice to be picked up again as a department tradition." Having an established program in place made the transition smoother.

In addition to having an established program, a subtheme of creating a soft landing for students emerged within the pre-existing structure theme. The impact that an established program could have on students with no prior international experience was noted in Dr. Talley's comments such as, "I wanted to do something that wouldn't be too much of a culture shock, so a developed part of the world, but [one that] would still have challenges for them." As such, he believed Prague would be a "pretty good match" for them.

The second part of objective one dealt with what motivated faculty to lead a study abroad course. Two themes and five subthemes emerged when analyzing faculty's motivations for leading a study abroad course or experience: build international human capital and connectivity and networking. The building international human capital theme was further broken out into three subthemes: global awareness, diversity appreciation, and intercultural competence. The connectivity and networking theme included the subthemes lifelong friends and professional opportunities. The emergent themes and subthemes have been highlighted in Figure 2, and descriptions of the themes and subthemes follow in the text below.

Figure 2. Themes and subthemes emerging from participants' responses to a question about initial motivations for leading study abroad courses



Theme 1: Build International Human Capital

As for using study abroad to acquire specific agricultural content knowledge, Dr. Lee admitted that China is known for some of the world's best and most intricate landscape architectural designs, and that is one reason she chooses to take students there each year. However, her main objective is to allow students to "see the world and open up their horizons – to make them think anything's possible instead of everything being super practical." Dr. Schuster took it a step further by admitting that he "didn't do a lot of agriculture" on his study abroad experiences. For him, the experience is less about his students seeing agriculture and more about providing them an opportunity to observe a different way of life. In fact, he noted that sometimes when students are exposed to agriculture, such as visiting "a real farm" or "a sheep experiment station," problems with reentry into the US can occur. As such, for him, it is easier to refrain from participating in these types of activities. Instead of acquiring specific knowledge in technical agriculture, the theme build international human capital is comprised of the statements made about helping students become globally aware, appreciative of diversity, and competent in and sensitive to intercultural relations.

Dr. Schuster explained: "The big thing is getting students comfortable outside their comfort zone [and] eating food that they've not really ever thought about eating." For Dr. Kutcher, it is bigger than just the food they may or may not have thought about eating. He stated, "There's a lot of things that unite us and make us similar, but there's a ton of things that make us different. We are not all the same. I can talk to you about the uniqueness of other peoples and places, but there's nothing like being there." Dr. Talley expected students to create a "ripple from their experience with the students they work with as they go to rural Oklahoma" and use these experiences as an "opportunity to expose students to a different culture."

Global awareness was a subtheme for the theme – build international human capital. Faculty discussed the power that traveling abroad had on creating rich, meaningful, and relevant learning opportunities. When discussing student learning, Dr. Kutcher stated, "I can't sit in a classroom and make that happen as well as I can on a mountaintop in

another country at four in the morning when the sun's coming up." Study abroad experiences allow faculty to cultivate richer and deeper learning and serve as a benchmark of students' lives that they will reflect on forever.

Part of what comprised the global awareness subtheme is students' ability to navigate transportation systems. Dr. Schuster expressed that some students have never left the state, much less traveled internationally. His goal is to increase their confidence in traveling to a large international city, navigating a busy airport, and conquering the bus and subway systems so that they feel confident in traveling again in the future if and when their careers or lives warrant it.

Although sightseeing is an important component of traveling internationally, it is not the driving force behind leading an international study abroad experience. Dr. Kutcher explained that most people who travel to Central America want to see "two or three grand things," such as the Mayan Ruins or Machu Picchu and "then they go home." Although he also wants his students to see these tourist attractions, he admits he is after "a different kind of tourism." He desires for them to "live in a village" and "home stay with some families." It is through these intimate and personal interactions that students begin to understand and appreciate diversity on a deeper level.

Not being able to speak the native language can be a barrier regarding a person's intercultural competence. However, faculty admitted to dealing with the language barrier in different ways. For Dr. Lee, a natural-born citizen of China, the Chinese language is not an issue. She stated, "I can speak the language." However, others are not so fortunate. Faculty must navigate and overcome the language barrier to be efficient and effective. Dr. Kutcher explained that he was so adamant about Central America when he began developing his course that he enrolled in and completed two semesters of Spanish. He stated, "Before I took students the first time, I took freshman Spanish across campus at Oklahoma State University. I was in my 40s when I sat in there with a bunch of 19-year olds and took two semesters of Spanish. I was committed. I was getting up at four in the morning to review my Spanish. Today, I can go to a Latin America country – South or Central America – and I can survive. My Spanish is good enough." Although his desire to learn Spanish is impressive, Dr. Kutcher admitted that overcoming the language barrier is more about observation and interpretation than it is becoming fluent in the native tongue. He stated that it is possible to overcome the language barrier "even if English is not the first language" by observing signs and people.

Theme 2: Connect and Network

When analyzing the interview data regarding the faculty's motivation for leading study abroad experiences, a theme that consistently emerged was connectivity and networking. Dr. Schuster explained that he seeks to encourage his students to interact with people who are vastly different from themselves. Part of the interaction requires having an appreciation for the differences and similarities they share with others. Dr. Kutcher explained,

> There's a cultural story and you don't know those stories unless you live those stories. You got to go to the source of the culture. When you can make that connection and that tie, people will do anything for you. They know you're genuine. They know you're the real deal.

He stated further,

> I look for opportunities to get into the real fabric of the land, get to know people on a personal level, be accepted by these people. Then all of a sudden bridges are built, doors are opened, [and] stereotypes are left to the side.

Being open to learning a new culture increases students' appreciation for diversity, which was recognized as a subtheme. Dr. Talley discussed his hopes that students would stay connected with the people they met during his study abroad experience. He was motivated by a desire to have students "get to know the faculty that go on the trips with them" and having "kids go on this trip and then follow it up with a trip to the developing world." In Dr. Lee's course, US and China students are paired together to work on problems related to landscape design to allow "cultural exchange" to occur emphasizing further the desire to build long lasting relationships through connecting and networking.

Summary

The purpose of this study was to explore faculty motivations for developing and leading short-term study abroad courses or experiences. The respondents were asked to describe their motivations for leading short-term, study abroad courses or experiences and indicate what they expected students to gain from the international experience. Previous experiences, student inspirations, and pre-existing structures were the three themes that emerged regarding faculty's motivation for developing study abroad courses. Faculty admitted that before they were able to develop their course, they had to build their own confidence first. They achieved this in multiple ways. One traveled solo to his destination of choice to meet with former students and have them show him around the country. Another chose to travel to her home country, in part, because of her confidence in and familiarity with navigating the destination. The remaining two faculty used a pre-existing structure to plan out and orchestrate the experiences. One traveled along with the faculty member who was leading the course at the time to learn the names of the contacts and mentor under the guidance of the outgoing instructor. The general consensus was that faculty wanted to increase their confidence so they could increase the students' confidence. In multiple instances, faculty responded that their students were the motivating force behind their decision to attempt study abroad. Based on this conclusion, it can be implied the faculty in this study are concerned about student learning and are willing to adjust and adapt to their students depending on their needs and desires. Is it possible that faculty who conduct high impact learning experiences, like

study abroad, are naturally more student-centered and flexible in their teaching approach than those who do not?

Regarding their motivation to lead a study abroad course, two major themes emerged: build international human capital and connectivity and networking. Multiple instances, faculty discussed the importance of helping students increase their global awareness as they believed the skills, knowledge, and experiences students gain from faculty-led study abroad courses can improve future relations with people who are different than them. This finding coincides with research conducted by Dooley et al. (2008) who concluded that for international collaboration to occur in the future, faculty must establish personal relationships with cultures different than their own. Faculty acknowledged that they wanted to show students the agriculture that existed in the country they were visiting; however, using study abroad as a tool for teaching agriculture was not the driving force behind going. What was more important was that students experienced another culture.

In addition, when assessing motivation through an expectancy-value lens (Eccles et al., 1983), the time necessary to plan and lead a study abroad course emerged as a cost factor for faculty (Flake et al., 2015). Each faculty member was employed on a heavy teaching appointment and recognized that time can be a barrier to those who are not yet tenured or who carry heavy research appointments. This finding aligns with research by Dooley et al. (2008) who discovered that assistant professors who were attempting to achieve promotion and tenure were the group of faculty who were affected most by leading study abroad experiences due to their heavier workload constraints and expectations.

Discussion, Implications, and Recommendations

It can be implied the faculty featured in this study have a desire to leave a lasting, lifelong impression on their students. The faculty featured in this study are creative and open to teaching in a way that elicits student learning. They are willing to invest multiple hours of preparation on their course, travel halfway around the world to visit remote areas, and sacrifice time away from their families to help make a positive impact for their students. Although the same could be said for numerous faculty, the four featured in this study were willing to go to extreme measures to make that happen. Because these faculty have heavy teaching appointments, their expectations are different than someone with a heavy research appointment. As such, they have been able to invest the time and energy necessary over numerous years to perfect their courses. Not every faculty member has this luxury. In fact, numerous faculty need assistance in getting their courses planned out and ready for delivery. Fortunately, various universities across the country have centers for effective teaching. Such centers can be a huge value-add to faculty in helping plan out experiences such as study abroad. High impact learning experiences are difficult to plan and orchestrate (Kuh, 2008) because they demand a higher-order level of thinking, which often requires professionals who understand course design and authentic assessment strategies.

Based on the conditions for selecting faculty for this study, only four met the criteria. Why were there only four faculty willing to lead study abroad programs in the College of Agricultural Sciences and Natural Resources at Oklahoma State University in 2016? Is it possible that the expectations for conducting scholarship de-motivates some faculty from conducting high impact learning experiences like study abroad? Professional development opportunities should exist for faculty who may be interested in developing and leading study abroad experiences (see Roberts et al., 2016; Dooley et al., 2008). Special emphasis should be placed on helping faculty collect data on the impact such a course has on student learning and using it to satisfy part of a faculty member's research expectation. If Oklahoma State University expects to reach its goal of having one-half of its student body participate in study abroad experiences, additional faculty will have to be recruited and prepared. Therefore, providing faculty members, such as the ones featured in this study, a forum for which they can share their stories and provide mentorship to prospective faculty who are interested in developing and leading a study abroad course is an imperative task to consider.

The current study adds to the literature on the prohibitors and motivators of faculty in food, agriculture, and natural resources. However, this topic has not yet been examined in sufficient detail to provide a complete understanding of the phenomenon. Additional research is warranted with other faculty in food, agriculture, and natural resources before, during, and after they lead a short-term study abroad course or experience (Dooley et al., 2008). A few questions resulting from the study include the following: How do affective memories of faculty regarding international experiences influence course delivery? How does this influence geographical setting? Are there observable differences between affective memories of international experiences and course requirements?

Three of the four faculty interviewed in this study were tenured at the rank of full professor. In addition, these faculty carry a heavy teaching load with three of the four having an 80% teaching appointment or higher. Interestingly, none of them currently have, or ever have had, a research appointment. Thus, the expectation is for them to be excellent teachers first and foremost. Unfortunately, not all faculty have the luxury of planning and delivering study abroad opportunities due to their faculty appointments and expectations. In this case, the outside effort cost and loss of valued alternatives cost might be the most substantial prohibitors to faculty developing and leading short-term study abroad courses (Barron and Hulleman, 2014; Flake et al., 2015).

Discussion

It is clear that time and expertise are essential necessities when establishing high impact learning experiences such as study abroad. It takes a substantial amount of time and energy to plan, deliver, and assess high-quality learning opportunities that have the potential to impact student learning long term (Kuh, 2008). The faculty in this study spoke openly about using their former and personal

experiences in their chosen country to impact the design of their course. They also referred to having an existing structure that, or in one case, a mentor who assisted them in developing their course and navigating their experience. What about faculty at universities who do not have access to such a structure or mentor? Maybe a medium, such as a clearinghouse website, is needed where information (i.e., personal contacts, course syllabi, best practices) can be provided and shared openly with faculty across the country related to study abroad experiences. Doing so might allow additional faculty to benefit from lessons learned from those who are leading study abroad courses currently and provide their own students the opportunity for rich learning experiences with the potential for high impact.

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A CASE STUDY OF CULTURAL ACQUISITION FOR PRE-SERVICE AGRICULTURE TEACHERS THROUGH INTERNATIONAL SERVICE-LEARNING STUDY ABROAD

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Abstract

The purpose of this case study was to describe the activities that provide pre-service agriculture education teachers with intercultural development while completing an international service-learning project. The 2018 Scotland Service-Learning study abroad facilitated by the University of Georgia was a bounded case. This study used qualitative case study research methods; semi-structured interviews and guided reflective journals that were collected during the spring of 2018. Four pre-service agricultural education majors were sampled. Findings of this study revealed that students benefited from the study abroad trip in the areas of assuaging preconceived ideas, balancing cultural bias, travel, teaching, culture, and experience impact. Participants returned with renewed passions for teaching and creating engaging experiences for their future students along with a new awareness of the importance their culture and the cultures of others can play in creating memorable teachable moments for students. The findings of this study support that undergraduate study abroad programs in colleges of agriculture can be effective at increasing undergraduate students' cultural acquisition.

Introduction

Historically, students decide to study abroad based on the opportunity to see new places and experience new cultures (Williams, 2015). The desire for experiences abroad has become popular by both students and faculty at colleges and universities across the nation. This has created a dramatic rise in the number of programs and universities

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offering study abroad programs (Anderson et al., 2006). Each year, more than 300,000 students study, intern, or volunteer in an international setting in various subjects and locations for times that range from a week and a half to an entire semester (USA Study Abroad, 2018).

Due to the origins of our nation, diversity has been the basis of our society (Bisin, 2000). Despite the diversity of the overall culture, many do not have experiences beyond the limits of their personal culture. Williams (2015) suggested that we filter new information through what we understand based on our own cultural understanding and our previous experiences. We view our society through this lens and choose the next step we take, including the choice to learn about ourselves and others by enrolling in study abroad opportunities.

Foster et al. (2014) described study abroad experiences as transformative life experiences in which students enhance their leadership and become more globally aware (Stephens and Little, 2008). These experiences become life-changing because students are challenged to recognize the preconceptions and ideas they have of other cultures (Phillion et al., 2009) and begin to explore their own cultural beliefs they had not recognized prior to the experience (Cushner, 2009).

Service-learning serves as an authentic learning method and learning environment that has roots in "reflection, application of service, duration and intensity of service, exposure to diversity, community voice, and feedback that leads to student development and a cross-cultural education" (Woods, 2004, p.15). Service-learning meets the goals of an institution by organizing activities that enrich the course content from the classroom in a way that provides deeper understanding through reflection and a broader appreciation of discipline for students in credit-based experiences (Bringle and Hatcher, 1996).

International service-learning trips have been ubiquitous in study abroad and can provide a unique experience for each participant (Stebleton et al., 2015). These trips allow for increased intercultural understanding through international work or volunteer opportunities in which students enhance their thoughts about global issues and cross-cultural skills through teaching methods not found in study abroad alone (Mahon, 2006; Stebleton et al., 2015).

Beyond work with local communities, pre-service teachers can benefit from international service-learning experiences. Upon returning from international service-learning trips, pre-service teachers reported they were more likely to bring new ideas and reduced stereotypes into their classrooms due to being more culturally confident (Walters et al., 2009). The world has become ever more intertwined; however, our cultures have become more diverse. This new diversity includes: "ethnic groups' cultural values, traditions, communication, learning styles, contributions, and relational patterns" (Gay, 2002, p. 107). Teachers who return from study abroad or international teaching experiences with globalized mindsets are often better able to relate to students' experiences due to their higher levels of self-efficacy and sensitivity to issues related to culture (Medina et al., 2015; Quezada, 2004; Walters et al., 2009).

The purpose of this case study was to describe the activities that provide pre-service agriculture education teachers with intercultural development while completing an international service-learning project using the 2018 Scotland Service-Learning study abroad as the bounded case. This study was guided by the following questions:

1. What cultural experiences during an international study abroad have the greatest impact on pre-service teachers' teaching abilities?
2. What cultural experiences during an international study abroad have the greatest impact on pre-service teachers' cultural development?
3. What cultural experiences during an international study abroad have the greatest impact on pre-service teachers' willingness to be a global citizen?

Materials and Methods

This study followed a qualitative collective case study design (Creswell and Poth, 2018) that was used to describe how four pre-service agriculture teachers gained cultural competency for multicultural education through an international service-learning experience. As with all qualitative research, the data presented cannot be generalized but can be transferred if the case has similarities to other study abroad programs. The case study was a bounded case in that the participants were involved in the activities for a set amount of time and in a specific place (Creswell and Poth 2018). The Institutional Review Board at the University of Georgia approved this study and all participants in the course were provided with and signed two copies of informed consent prior to participation in this study. Data collection was focused principally on semi-structured interviews prior to and after the trip, along with participants' prompted journaling. During the pre-trip interview, participants were asked to discuss their previous travel and teaching experiences, why they chose this study abroad trip, their knowledge of Scottish history and culture, their attitudes towards other cultures, and how they expected this trip would change their behaviors towards cultures. During the post-trip interview, participants were asked to discuss the same subjects with the subtraction of their previous travel and teaching experiences and the addition of their thoughts on how others (i.e., family, friends, and classmates) perceive their growth and development due to their: (a) travel abroad experiences, (b) the most impactful experiences while abroad, and (c) suggestions they have for the course moving forward. A description of participants can be found in Table 1. Prior to meeting with college students and professors from a partner school in Scotland, the participants were taken on tours of cities throughout Scotland and exposed to traditional dinners. Participants met with Scottish college students at a research extension center to network and write lessons in order to teach students at a local primary school where they would interact with kindergarten through fifth-grade students on science-related subjects. Each night of the trip, participants were led through a group reflection by a different person prior to completing reflective journal writing.

Data Analysis

Data analysis consisted of transcription, familiarization and coding of interviews, and categorization. Researchers conducted interviews, transcribed responses, and examined transcripts in order to identify patterns in participant responses. Lincoln and Guba's (1985) four-step constant comparative method was used to analyze the data. Steps included: 1) Creating categories with themes that emerge from the data 2) Reanalyzing data and reinterpreting themes; 3) Combining categories as the themes become more distinct 4) Building explanations about student learning teams (called "pupil voice groups") from the categories that emerged from the data.

MaxQDA developed by VERBI Software was used to code and analyze the data. Peer review and repeated analysis was used to ensure transcripts and codes were reviewed multiple times to increase trustworthiness and rigor. Semi-structured interviews and guided reflective journals were used to triangulate data. With each review, codes were reevaluated and redefined. In order to ensure the trustworthiness and rigor of the study, the researchers confirmed the credibility, transferability, dependability, and confirmability of the study (Lincoln and Guba, 1985). After each interview, the major data points were shared with each participant for member checking and peer debriefing was used to ensure the trustworthiness of the data analysis process. The researchers used dependability and confirmability journals to ensure that all decisions did not deviate from the prescribed analysis or data collection methods and, following the study, an audit was conducted.

Subjectivity Statement

The researchers acknowledge that they were intimately familiar with the Scotland study abroad program and the students who participated in this study. All researchers were either faculty members or graduate students engaged in facilitating the study abroad program.

Results and Discussion

Setting the Case

This study followed four undergraduate students who were all agricultural education majors with varying degrees of international travel experience. The original names of participants were changed to ensure privacy. Jess (female) was a third-year student from rural Georgia who had been involved in agricultural education at the secondary (high school) level and had some teaching experience. Ben (male) was a first-year student from rural Georgia who had been involved in agricultural education at the secondary (high school) level and had some teaching experience. Gabby (female) was a third-year student from an urban center in Georgia who had been involved in agricultural education at the secondary (high school) level and had some teaching experience. Finally, Katie (female) was a second-year student from an urban center in Georgia who had no experience in agricultural education at the secondary (high school) level and had no teaching experience (Table 1).

The study abroad trip was a ten-day trip held over spring break in March of 2018. University of Georgia students traveled to London and Scotland's Edinburgh, Inverness and Dumfries where they implemented service-learning projects and participated in academic and cultural events. Specifically, the University of Georgia students trained primary school students to build school gardens at Troqueer Primary School and designed and delivered lessons and teaching resources related to agricultural, environmental, and science education. University of Georgia undergraduate students worked in partnership with undergraduate education majors at the University of Glasgow, Dumfries Campus. Undergraduate students from both institutions worked in teams to engage elementary students in the Dumfries school system and taught agricultural, environmental, and science education lessons. In particular, this school was chosen for this trip due to the headteacher's ability to implement innovative teaching strategies that helped the school make significant improvements in their student performance and national rating.

Before the study abroad trip, participants attended nine class meetings and completed/attended:

1. Current event research on Scotland and the Scottish Educational System.
2. A review of the literature on barriers to teaching agricultural, environmental, and science education.
3. Team lesson plans on agricultural, environmental, and science education.
4. Virtual class sessions with undergraduate students from the University of Glasgow to develop teams and lesson ideas.

During the study abroad trip, participants:

1. Attended meetings with University of Glasgow undergraduate education majors to build lesson plans.
2. Spent three days at Troqueer Primary School working with University of Glasgow undergraduate education majors teaching lessons to primary students.
3. Participated in group reflections where the

Table 1. Description and characteristics of participants

Name	Year in School	Urban/Rural	Involved in AgEd during School	Taught Previously	Traveled Internationally
Jess	3rd	Rural	Yes	Yes	Yes
Ben	1st	Rural	Yes	Yes	Yes
Gabby	3rd	Urban	Yes	Yes	Yes
Katie	2nd	Urban	No	No	Yes

experiences of the day were analyzed.

4. Recorded a digital journal of their daily experiences where they reflected on their own cultural acquisition.

After the study abroad trip, participants:

1. Attended a final meeting with their Scottish teammates where they discussed the impacts of the study abroad experience.

Qualitative Themes

Six major themes emerged from this study to describe the cultural acquisition of pre-service agriculture teachers, including preconceived ideas, balancing cultural bias, travel, teaching, culture, and experience impact. Preconceived ideas present participants' ideas about other cultures, their past experiences, what they expected to learn while in Scotland, and the stereotypes they held entering the trip. Balancing cultural bias follows participants as they enter the culture of Scotland and were challenged by what they experienced. In this theme, participants struggle in order to adapt to new environments and their growth in cultural sensitivity. Travel explains participants' past experiences traveling and how this international experience has impacted their thoughts on future travel. The teaching theme establishes participants' past teaching experiences, knowledge gained from teaching experiences in Scotland, and the future impact this trip will have on teaching and cultural sensitivity. The culture theme shows participants' prior knowledge of cultures, knowledge gained about the culture of Scotland and the United Kingdom, and finally, this theme provides evidence for participants' acquisition of cultural diversity and cultural sensitivity. Experience impact sums up the entire experience participants had and answers the research question of which experience was the most impactful for pre-service teachers. During data collection, participants explained their favorite experiences and their "trip catch-phrase." Each theme and the sub-themes will be discussed in greater depth and will be supported by participants' raw quotes to describe the essence of their overall experience.

Preconceived ideas were operationalized as the understanding, knowledge, or beliefs about Scotland and other cultures students held when entering the course and the study abroad experience itself. Participants displayed a very shallow knowledge of Scotland and the Scottish culture before leaving for the trip. All participants described their pre-trip knowledge being limited to the more stereotypical aspects of Scottish culture such as kilts, bagpipes, and some of the food. Ben stated, "I really don't know a whole lot about the Scottish culture… I just know from what I've seen on TV and in movies and in Braveheart and that's about it" (86:89). Students expressed their personal biases about interactions with cultures different from that of the United States and used words like "strange," "weird," or "odd." Jess, a Georgia native, said she was "biased and [has] preconceived notions" (126) about other interactions with people with varying religious beliefs and of different cultural backgrounds. The bias of participants was not only focused on those in their home community or college classrooms; participants also spread their view to that of other countries. Ben felt that America was the standard that every nation should strive to be like in every way as his lack of exposure to information and contact with other cultures (164:165) left him with a myopic and nationalistic view of the world.

While on the trip, participants had experiences that challenged their preconceived biases and forced them to work in a new equilibrium with the addition of this new knowledge and experiences. Participants were faced with traveling the country and learning how to navigate the public transportation system. While on the trains, participants made many observations and compared them to the use of public transportation in the United States. Participants were taken aback by the amount of Scots that used public transit versus the number of commuters on the participants' home campus. Specifically, Gabby "realized that the locals use the trains more than [she] thought they did (342:343). Participants had a chance to meet with a cattle farmer while touring the countryside and Ben felt that this experience would not only be a "memorable moment" but would also help him to become "a better agriculturalist all around" (279:280).

Participants were confronted with differences in culture when observing others engaged in simple daily tasks. In his post-trip interview, Ben told of keeping his typical morning schedule which included watching the news broadcasts which were an unexpected shock that they were "reporting like that just happened here yesterday," (601). Ben was shocked because he felt the newscasts were discussing "our news" (191), and that they would call out names of American officials without their titles, whereas the United States based broadcasts would have clearly defined whom they were discussing and where they were from (600:601).

In addition to facing their preconceived biases, participants also found themselves assimilating into the Scottish culture after seeing the differences which allowed them to overcome and make gains in cultural competency. Katie had a specific experience where she believed that she had made a true assimilation into the Scottish culture. During this experience, she was "in a pub with some University of Glasgow students and it was just [her] and them" (512) and an "older lady in the pub walked up to them and they talked about their time in University and assumed that [Katie] was also a [Scottish student]" (512:514). She describes it as a "really cool moment for me" (514:515). Gabby felt much different than the other participants and as though the group never fit in and that there were many differences that halted her assimilation into the culture. In her post-trip interview, she stated that "[she] felt like we stuck out everywhere" (545).

Due to this experience, three of the four participants felt as if their openness to different cultures had grown. Ben felt as if "maybe they'll have something to learn from me and maybe where I come from, just as much as I have to learn from them and where they come from and their culture" (93:95).

As previously stated, all participants had traveled internationally prior to this trip, and all trips had been for family vacations. Despite previous travel, Jess was admittedly nervous about the trip as she is, "not the kind of person who likes to travel, I don't really like being on

planes, and I like being at home" (195:197). Gabby, on the other hand, was highly interested in global travel, in fact, Gabby "aspires to be a world traveler," (199) and has "always wanted to experience going on [a] really long travel [experience]" and thought "this [would] give [her] a chance to get [her] toes in the water on how it is to be able to travel to different places that are so far away" (111-113).

During the trip, growth was seen in all of the participants' desires or aspirations to travel. Through seeing the Scottish Highlands and the various landscapes throughout the countryside, participants began to realize that there were so many parts of the world they hadn't yet seen and now desired to see it. Ben reflected on an impactful travel experience writing, "my thought[s] on global travel have widened in the fact that I realized, just as I hadn't seen the Scottish Highlands until today, there are many other beautiful parts of the world I have not seen and would probably like to" (263:265). He also felt that seeing more and more of Scotland would help him during future travels as he would be able to relate and compare his past experiences to his new ones. Jess said that she "was sad [it] was our last day" (546) but she also couldn't "wait to travel back to explore the cattle and sheep side of agriculture in the UK and Europe" (300:301).

After coming back to campus, participants had time to reflect on their travel experiences and the effects it had on their self-efficacy, value seen in travel, and their openness to future travel. Participants who began the trip with feelings of skepticism or fear for travel proved to themselves that travel was an exciting and positive experience. Ben felt as though, "now that I have done it, it's like I can do that, I can get in an airplane and fly over the ocean, might as well do it some more" (710:711). Participants began to value world travel due to this experience. Specifically, Jess said she sees the value of "observing different cultures and different parts of the world in agriculture or education… its more important [to her] now" (634:636).

The teaching theme was based on finding the baseline experience for all participants before establishing evidence for teaching methods learned, the emotions dealt with, and participants' plans for their future classrooms. Three of the four participants had previous teaching experiences all in informal settings (Table 1).

Prior to leaving for this trip, participants exhibited several emotions based on their past experiences. Ben was hopeful that the teaching experiences would place him in "situations" that he might encounter later on and that he would "know how to handle that because of this experience" (182:184). Ben also expressed a very American-focused view of education, saying that "all that [he had] ever paid attention to in education is what is going on here [the United States]" (161:162).

Ben presented a point-of-view that other participants did not in his pre-trip interview; that of an effective teacher. He felt that being an effective teacher meant having rapport or strong connections with students as well as being able to "convey information and have your students retain that information and then be able to expand on that information even more" (149:151). In addition, he believed "the more well-rounded you are, that leads to more conversations and it helps you to make connections" with students (138:139).

In addition to being exposed to daily and social activities that challenged them, participants had new experiences within the classroom as well as planning that challenged them. While planning, Gabby experienced challenges with lesson planning in terms of "finding ways to make the lessons more engaging for all of the students to want to keep participating in these lessons," (244:246) because "they need extremely high levels of engagement and lessons with lots of different activities" (285:286). Within the classroom, three participants expressed that they faced difficulties. Jess found that "starting with a rule to follow to show they are listening was best to keep them focused" (484:485), and Gabby shared that she would like to handle behavioral issues by "finding ways to make lessons more engaging and hands-on" (641:642).

Participants were able to observe some similarities and differences between the education systems of the United States and Scotland. Three participants were in admiration of how excited the students at the primary school were while they were in class, saying it was "an awesome system to have students really get super involved in the things they are learning" (Gabby, 129:130), or "I'm really excited to see how this school system runs being a hands-on school and being student-led" (Ben, 69:70).

Participants went through a process of self-discovery through their teaching experiences. Some realized preferences, others became interested or excited about certain aspects of education, yet all felt their passion for teaching. Jess reported that because of this experience she "felt like [she] knew where [she] belonged, being in the classroom is a passion and a career I am certain I can achieve" (491:492); Katie found her passion for teaching while "seeing their gears clicking as they comprehend what you tell them and show them" (406:407). Other participants reported an increase in interest and enthusiasm for teaching with increased certainty that teaching was the correct career path for them.

The culture theme was operationalized as participants' understandings of their own positions in society and the American culture. The knowledge they gained from historical site trips and interactions with people from across the country of Scotland emerged from pre-trip feelings, experiences during the trip, and post-trip reflections.

Participants had close-minded views of other cultures at the beginning of this class and into the trip, in part because of their lack of knowledge of different cultures. Katie says she had "a very small knowledge of culture because I have lived in the same area my entire life" (70:71) whereas Ben has "always had a mindset of, you know, America is the best at everything" (164:165).

Despite their close-mindedness and stereotypes, students were hopeful of the cultural acquisition they would gain. Gabby hoped she would have a "better understanding of why things are happening the specific way in that part of the world" (86: 87); Ben hoped to "come back very well educated" and to be able to "share those experiences that I've learned with friends and family" (115:117).

Because of our cultural connections, participants' conceptions of Scottish people and their culture were

widened from kilts and bagpipes to a perspective of welcoming and prideful of their history, their family, and their future. Jess noticed multiple times the pride that was exhibited, noting how "very prideful and caring the Scots are about making their guests feel welcome" (511:512).

Participants also found similarities between Scottish culture and American culture, including the desire to be independent of the crown and architecture within the cities. Jess commented on the experience of visiting the battlefield at Culloden. "The thought of Scottish people uprising in order to leave the U.K. is something that I never thought about" (672-673). She reflected on her knowledge of the American revolution and said, "I think that is one of those things that you think someone declares independence and that's how it happens, because that is how it is taught, but there are so many countries that are still under the reign of the Queen that can't get out, so that was one of those things that was pretty neat" (677:680).

Impact of experience was operationalized as the long-term effects of the experiences on participants. The theme of impact also identifies the top experiences participants had while in Scotland. Participants reported that the most impactful experiences were working with the students and teachers at the primary school. The University of Georgia students spent three days at Troqueer Primary School working with University of Glasgow undergraduate education majors teaching lessons to primary students in Agricultural, Environmental, and Science Education. In a single quote Ben summed up the feelings for all participants on the top two impactful experiences when he said, "the biggest thing I took away from this experience would just be uh, probably the teaching experience" (613:614) and "well right behind working at the elementary school like I said, the sightseeing" (776). Cultural connections with Scottish college students, Marco, and Louis were all important to the students because they were able to get the "Real Scotland" rather than what they would have gotten if they had gone on their own.

Participants were asked to give a phrase that would summarize their experience and the lasting impact it had on them. To summarize all of their experiences, "it's the experience you will never expect, but the experience that you will never forget" (Katie, 739:740).

Summary

The findings of this study pertaining to teaching support the findings in the literature and answer aspects that previous studies have not explored, including determining what cultural experiences have the greatest impact on pre-service teachers' teaching ability, cultural development, and willingness to be a global citizen. Teacher education programs should be encouraged to incorporate an internationalized curriculum and cross-cultural experiences for pre-service teachers, including study abroad trips, as these can have a maximum impact on the teacher education curriculum (Cushner, 2009; Wilson, 1993).

Smolcic and Katunich (2017) found that providing pre-service teachers with intentional opportunities for cross-cultural learning coupled with social interactions among other cultural and linguistic groups can provide positive outcomes when structured reflection was incorporated. These learning outcomes were revealed after teacher educators helped their students "reframe their moments of distress while abroad into theoretical, pedagogical, or global frames" (Medina et al., 2015, 119). This study found that structured, individual reflection time and group facilitated processing at the end of each day while abroad benefitted students immensely.

There was a lack of literature regarding how touring parts of a country allow participants to more deeply understand the culture of the country they were visiting. During this study, we found that pre-service teachers placed value in touring cities across the country, seeing sites that presented the history of the country as well as pop culture spots that were famous around the world. In addition to the cultural host, students enjoyed having a tour guide to share points of view on the culture they were immersed in. The participants in this study enjoyed traveling to see the different regions in Scotland as well as meeting the people. Upon returning to the United States, participants reported that they had higher self-efficacy due to their experiences. This supports the conclusions of Long (2015) who reported that students refer most often to the experiences of seeing new sights, meeting new people, confronting a different culture and navigating a strange land as highlights.

Study abroad experiences present their own set of anxieties, for faculty and students. There are fears that keep students from traveling abroad, such as students being outside of their culture or linguistic zone. However, through coaching, this can be overcome (Harsch and Poehner, 2016). However, "to prepare their students to be citizens of a global and a national society, prospective teachers need to themselves become comfortable as citizens of the world" (Wilson, 1993, p. 25).

Recommendations for Research

1. More research should be done on the value pre-service teachers place in the experiences provided to them by the faculty advisors of their trip.
2. More research is needed on the effect free time has on the cultural development of study abroad participants. For example, does time to explore a city with more freedom create an opportunity for students to gain more cultural competency?
3. Additional research is needed to gain a better understanding of the value of these study abroad experiences as the importance and number of persons engaging in these trips increases.
4. Finally, studies should be conducted on the likelihood that study abroad alumni stay connected to global issues and news no matter their major or career path.

Recommendations for Practice

For faculty considering the development of a study abroad experience for pre-service teachers, the authors make the following recommendations:

1. Pre-service teachers expressed value of the reflective learning process. In agreement with previous research, faculty should use written reflection from students

to both formatively and summatively evaluate study abroad programs and be willing to make modifications based on student feedback.

2. Faculty should utilize meaningful pre-departure and post-trip class discussion.

3. Faculty should actively use learning theory to inform curriculum decisions regarding study abroad.

4. Faculty should create an environment of openness for students to share views and opinions regarding cultural observations in the country they visit.

5. Teacher education programs should be encouraged to incorporate an internationalized curriculum and cross-cultural experiences for pre-service teachers, including study abroad trips.

6. Faculty should engage in cultural activities such as: touring cities across the country, seeing sites that presented the history of the country as well as famous pop culture sites.

7. Faculty should pair students from the host country with students from the United States early on in a semester and need to actively engage all students in activities in order to facilitate cultural learning from both cultures.

8. Faculty should utilize technology to facilitate structured communication before and after the study abroad trip.

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Service-learning on a Caribbean Island: Student Self-Assessment of Professional Skills and Sustainability

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Abstract

The combination of study abroad and service-learning opportunities has been described as transformational when student perspectives shift to a wider world view. One example of an international service-learning program, EARTH (Education and Resiliency Through Horticulture) program, is a school gardening initiative at Gifft Hill School, St. John, U.S. VI. Twenty-one Iowa State University students that participated in the EARTH program responded (91% response rate) to a survey to determine the impact of service-learning on student's professional development and perceptions of sustainability. The majority of students agreed or strongly agreed that they were challenged to: 1) use critical thinking skills to solve problems (99%), 2) work better with others (80%), and 3) learn more about teaching and educating youth (95%). All students agreed or strongly agreed that they developed new or expanded personal and professional capabilities while on St. John. Ninety-five percent of students agreed or strongly agreed that they learned about conserving resources such as water or soil. Almost 81% agreed or strongly agreed that they use sustainable practices more often at home, and 85% agreed or strongly agreed that they look for ways to limit wasteful uses of resources. This study showed that the service-learning during a study abroad program provided a valuable opportunity for undergraduate student development as global citizens.

Introduction

Integrating global learning and service-learning into university curriculums and experiences has been shown to be important and impactful across many disciplines, including agriculture (Anderson et al., 2006; Black et al., 2013; VanDerZanden et al., 2007; Zhai and Scheer, 2012). Service-learning and study abroad courses both provide a means of integrating experiential learning into program curricula (Barkley, 1999; McLaughlin and Johnson, 2006) and share philosophical roots (Dewey, 1963; Freire 1970; Kolb, 1981 and 1984). When combined they can have a powerful or transformational impact on student learning (Coers, et al., 2012; Francis, et al., 2011; George, et al., 2011; and Parker and Altman Dautoff, 2007).

The EARTH (Education and Resiliency Through Horticulture) Program is an international service-learning program collaboration between Iowa State University, Ames, IA and Gifft Hill School, St. John, U.S. VI (GHS). GHS is the only private K-12 school on the island. The six goals of the EARTH program are: 1) design, install, and manage attractive landscapes for sustainable food production, 2) integrate hands-on horticulture and place-based environmental science into a middle school curriculum, 3) provide healthy, locally-grown food to the Gifft Hill School community, 4) create and utilize outdoor classroom space for students to learn and connect to the natural world in a meaningful way, 5) create a positive perception of horticulture and knowledge of food origins and benefits, and 6) integrate Iowa State University (ISU) student interns and Gifft Hill School students in classroom and elective activities.

St. John is a 52km2, Caribbean island, and is one of three main islands in the U.S. Virgin Islands. St. John is mostly tropical moist and tropical dry forest and more than 60% of the island is national park. Of the 4,170 residents, 2,460 of them are employed in private, civil industries (US Census Bureau). Seven hundred sixty of them are employed

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in arts, entertainment, recreation, accommodation and food services that provide for the 2,000 or more people who visit St. Thomas and St. John each year (US Virgin Islands Bureau of Economic Research). Another 318 work in the construction industry and are largely dependent on demand for vacation homes on island (US Census Bureau).

Life on St. John presents unique challenges. The island has steep terrain and shallow, rocky soils. The geology doesn't support a water table on much of the island. Water used for drinking, irrigation, and hygiene is either collected from roofs and stored in cisterns or purchased from a desalination plant. Accordingly, water is valued highly and used carefully. Most food is imported to the island from the continental U.S. Due to extra shipping costs and the high cost of electricity [47 cents per kilowatt-hour (National Renewable Energy Laboratory)], food costs are also high. These factors make conservation on island a necessity and a way of life for locals.

For some of the ISU interns, this service-learning study abroad program provides the first opportunity for flying on an airplane or traveling outside of the Midwest. While living on St. John, ISU interns are exposed to a variety of new experiences and challenges. Students learn to manage multiple and sometimes opposing opinions of program stakeholders, successfully develop and present lessons to a wide age range of students, and work cooperatively in an environment requiring hard work and initiative.

Reflection and self-assessment is an integral part of both study abroad and service-learning (Black et al., 2013; Lamm et al., 2011). Student reflections and self-awareness of what they learned and how this new knowledge impacts further actions and behaviors, both professionally and personally, is paramount in evaluating the success of many programs, and ultimately the student experience. More documented evidence of the development of both professional skills and related content expertise from international service-learning programs is needed.

Objectives

The objectives of this study were to self-assess student perceptions of participation in an international service-learning program has assisted them with: 1) developing personal, interpersonal, and professional skills, and 2) developing their views and changing their actions with respect to sustainability after returning home.

Methods

Internship Overview

Prior to acceptance in the EARTH program, students must apply and are interviewed. Based on applications, one to two students were selected for each semester long program and up to 11 students were accepted in the Educating Youth through Horticulture, spring-break program. After acceptance, students are required to enroll and attend a pre-departure orientation course that meets once a week for 8-12 weeks as preparation for the upcoming semester-long internship. This one-credit course provides background information in four distinct areas: 1) production and maintenance of vegetables and tropical foods, flora, and fauna commonly grown on St. John, 2) history and culture of St. John and other US Virgin Islands, 3) an overview of the expectations and responsibilities as future educators while at GHS, and 4) opportunities to practice working in groups to foster group cohesion.

Each semester (spring, summer, and fall from 2010-2013) ISU undergraduate student interns travel to St. John for eight to 12 weeks. During that time ISU interns co-teach, with a Gifft Hill School instructor, gardening/environmental science classes to elementary and middle school students. Lessons also integrate language arts, health and nutrition, social studies, chemistry, biology, and art. ISU interns also perform general maintenance and upkeep of gardens at the school including patio and terraced gardens, the chicken flock, landscaping, and storage and work areas. Each intern also must complete an individual creative component or project. Examples of projects include 1) landscape designs with lesson plans on design principles and process, 2) landscape construction with lesson plans on building retaining walls, 3) water collection and drip irrigation with lesson plans on calculating water collected off of an area of roof and water pressure from a rain barrel, 4) composting with lesson plans on food safety, and 5) chicken coop construction with lesson plans on how to care for a chicken flock. Each project includes independent research, multiple hands-on activities and lessons to engage and educate youth, and a reflective summary of the project challenges and successes.

On island, ISU students are full-time students (minimum of 12 credits in fall and spring) with no more than 4 credits applying to Horticulture credits for degree completion. The remaining credits apply to electives. Student learning is assessed through regular reflections, teaching observations, and project evaluations. Reflection activities include weekly blog posts, weekly webcast discussions with instructors in Iowa, and one-on-one interviews during a mid-term visit to GHS by ISU instructors during the semester. Students are also required to give a 5-10 minute presentation at the semi-annual meeting attended by donors, faculty, and other stakeholders. During this presentation, students reflect on their experiences on St. John and share how service-learning through the EARTH Program has impacted their lives. These various assessments not only give students a chance to reflect on their experiences while on St. John and after returning to Iowa, they offer several opportunities to evaluate student learning (Lima, et al., 1999; Powell, 2009; and Steward, et al., 2004).

While most ISU students visiting St. John do so through the semester-long internship program, nine students visited the island for a week during March 2012. During this spring-break trip, students presented lessons that had been developed earlier in the semester as part of a horticulture class called Educating Youth Through Horticulture. Three groups of three students developed and presented lessons to either K/1, fourth, or 11th grade youth at Gifft Hill School. Two graduate students also worked on projects on St. John. Each graduate student spent a minimum of two weeks on St. John during two to three trips to conduct research and assist in completing program goals.

Survey Design and Analysis

A mixed-method approach was used to evaluate student perceptions and behaviors of professional and personal development and sustainability. An online survey through SurveyMonkey.com (Palo Alto, CA, USA) using the Tailored Design Method (Dilman, 2009) was emailed to program alumni on March 5, 2013, and follow up emails were sent to non-respondents March 7 and 12. The online survey consisted of 5 open-ended questions and 21 Likert type questions (Likert, 1932) with four response categories on a scale ranging from highly disagree to highly agree. Questions were divided into two categories, personal/ professional skills and sustainability.

The ISU Institutional Review Board deemed this study exempt. The survey was administered to a total of 23 ISU students who have traveled to St. John and participated in the EARTH Program between 2010 and 2013 as one of the following: a) a semester-long intern (10), b) an Educating Youth Through Horticulture student (11), or c) a graduate student (2).

Means and standard deviations were calculated from quantitative survey questions in Excel (Microsoft Corporation, Redman, Washington). Researchers analyzed the content of open-ended survey questions qualitatively, determined themes that emerged, and developed synthesis categories that represented responses (Collaizzi, 1978). All themes that emerged from open-ended questions are presented. Analysis of student reflections from blog posts, projects, and presentations were also used to confirm themes identified from open-ended questions.

Results and Discussion

Twenty-one students responded to the online survey for a 91% response rate. Five respondents were sophomores, seven were juniors, seven were seniors, and two were graduate students. Seven males and 14 females completed this survey.

Personal and professional skill development

Most ISU students agreed or strongly agreed that, as a result of participation in the EARTH program, they have a greater appreciation of other cultures, were challenged to work with others, and learned about working with kids (Table 1). ISU students also responded that they were challenged to use critical thinking skills to solve problems, learn more about horticulture and how best to educate youth. Most agreed or strongly agreed that their experience was one of the most rewarding professional experiences of their college career and that they would participate in the program again.

Students also responded to the following open-ended question: "What other impacts did this program have on you personally or professionally?" As expected, there was a wide range of responses to this question. Some exemplary student comments that showcase the variety of responses include:

> "I'm now getting a masters of education, this program was part of the reason I made that decision."
>
> "It was great to experience another culture and broaden my knowledge of horticulture. I would love to go back and do it again!"
>
> "I learned about another culture, teaching children, horticulture, and much more. It was just amazing."
>
> "I discovered that I'm capable of going and living in a completely new place for an extended period of time."
>
> "I had to develop independent research skills to complete my project".

In addition, several students commented that the EARTH program helped in "… solidifying where I could see myself [professionally] in 5 to 10 years." Several students responded that the EARTH program experience helped them become "… more accepting of different values and cultures" an important interpersonal skill for professionals. "It has emphasized the meaning of 'place-based'… That is something that I can apply in my personal life and profession"

Study abroad experiences have been shown to positively impact student behavior, particularly their awareness or acceptance of other cultures and diversity (Anderson, et al., 2006; VanDerZanden, et al., 2007, Zhai and Scheer, 2002). Yet, these impacts have not been limited to global perspectives or other "soft skills" as changes in critical thinking have also been documented (Roberts, et al., 2018, 2019; Wingenbach et al., 2016). Students rate themselves as significantly more confident in career-relevant skills following a community engagement service-learning project (Smith et al., 2014). This was evident in students participating in the EARTH program as well. Students frequently mentioned increased knowledge and connections to specific career-related content about horticulture, gardening, agronomy, environmental sciences or other related disciplines. By serving as educators, ISU students felt their knowledge of horticulture (and related disciplines) increased and they were more confident in their ability to teach horticulture-related topics to the public, which should lead to an increased ability to solve problems and better perform career-related responsibilities. Increased soft skills, critical thinking, cultural awareness, and technical knowledge developed during study abroad courses increase employability (Harder, et al., 2015)

Perceptions of sustainability

ISU students also indicated that their experiences with the EARTH Program have changed their perceptions of sustainability and behaviors upon returning to Iowa (Table 2). Twenty students, 95%, agreed or strongly agreed that they learned about conserving resources, 81% indicated they practice sustainability more often because of their time on St. John, and 86% said they look for ways to conserve

Table 1. Student responses to Likert Scale questions about the impact of the EARTH Program on their personal and professional skills.

	Highly Disagree 1	Disagree 2	Agree 3	Highly Agree 4	Count	Mean	STD
I learned about another culture	0	0	9	12	21	3.57	0.49
I learned about myself	0	1	12	8	21	3.33	0.56
I learned about my capabilities	0	0	14	7	21	3.33	0.49
I developed new or expanded existing capabilities	0	0	13	8	21	3.38	0.49
I changed my perspective of others	0	3	12	6	21	3.14	0.64
This was one of the most rewarding experiences of my college career	0	2	7	12	21	3.48	0.66
This experience was too far outside my comfort zone	12	8	1	0	21	1.48	0.59
I would do it again	0	0	5	16	21	3.76	0.43
I learned a lot about working with kids	0	1	8	12	21	3.52	0.59
I was challenged to work better with others	1	3	10	7	21	3.1	0.81
I will use what I learned in my future career	0	1	11	9	21	3.38	0.58
I changed the focus of my future career because of EARTH	2	11	7	1	21	2.33	0.71
I learned a lot about tropical horticulture	1	1	11	8	21	3.24	0.75
I was challenged to learn more about horticulture	0	4	8	9	21	3.24	0.75
I was challenged to use critical thinking skills to solve problems	0	0	8	13	21	3.62	0.49
I was challenged to learn more about teaching and educating youth	0	1	7	13	21	3.57	0.58

resources more often. When asked more specifically about recycling, ISU students indicated 64% of the time on average that their experience on St. John has changed their recycling practices (81% when phrased as positive, and 47% when phrased as neutral to correct acquiescence response bias).

These responses were supported by answers to open-ended questions.

> "I certainly find myself looking for ways to not waste or to produce with less available product."

> "It was educational to see how the people there have to adapt to the landscape, water shortage, and pests in order to have a successful crop."

> "I have a better idea of conservation and how important resources are."

Gibson et al. (2012) reported similar results with respect to the impact of study abroad programs on developing student understanding of the importance of biodiversity in Costa Rica. Specific sustainability themes that emerged for this study were conserving or reducing waste of limited resources such as water and soil, recycling materials such as plastic or cardboard, and sustainable crop production practices such as the use of organic fertilizers, cover crops, or mulches to reduce environmental impact and water loss. Recycling is more of a mixed issue in student responses.

As the popularity of study abroad programs has increased in recent years, the length of stay has decreased (Dwyer, 2004). Impacts on student perceptions and behaviors do not seem to be related to length of stay of international service-learning programs, as changes in student attitudes, actions, and behaviors have been documented in short-term study abroad programs (Chieffo and Griffiths, 2004; Gleason et al., 2017, and Perry et al., 2012). In this study even those students that spent a week on St. John also noted changes in their perceptions and their actions upon returning to Iowa. However, the sample size was not large enough to discern differences statistically. It is also interesting to note that these changes also seem to be long-lasting as some ISU students noted these changes in perceptions and behaviors in this survey almost a year

Table 2. Student responses to Likert Scale questions about the impact of the EARTH Program on their perceptions and behaviors related to sustainability.

	Highly Disagree 1	Disagree 2	Agree 3	Highly Agree 4	Count	Mean	STD
I learned a lot about conserving resources while visiting	0	1	8	12	21	3.52	0.59
I practice sustainability more often at home because of my visit	0	4	12	5	21	3.05	0.65
I look for ways to limit wasteful uses of resources like water because of my visit to St. John	0	3	13	5	21	3.1	0.61
I look for ways to reduce or recycle resources more frequently because of my visit to St. John	0	4	13	4	21	3	0.62
I reduce, reuse, and recycle the same now as I did before my visit	0	10	8	3	21	2.67	0.71

after returning to Iowa.

Summary

ISU students believe that this international, service-learning program was a valuable part of their college experience and important in their development as future professionals. Like many other international service-learning programs, the impacts seem to be meaningful and long-lasting. ISU student awareness of sustainability issues and conservation of resources in particular reportedly increased. Water conservation, soil fertility improvement, and reducing soil erosion are themes woven into the majority of garden related activities at GHS and ISU student responses show that this has positively impacted their perceptions and actions since returning to Iowa. Integrating service-learning with international and potentially domestic travel courses creates opportunity to enhance curriculum, progress students' understanding of concepts and how concepts integrate into real-world situations, develop and practice personal and professional skills, and change student perceptions and actions related to issues such as sustainability.

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International Topics Increase Global Awareness in Midwest Crops and Soils Courses

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Abstract

Global awareness of critical agronomic and related issues should be an essential component of today's agronomy courses. Our goal is to catalyze the education of young people who will be technically competent players as well as effective participants in the search for efficient food systems to feed a growing human population. Basic knowledge about crop and soil science, capacity to design efficient production systems, and use of an agroecology perspective to integrate information from biophysical and socioeconomic domains are valuable in a comprehensive undergraduate education. Yet they are not sufficient to prepare people to operate effectively in a complex global economic environment. To further complicate the picture, we are moving from two centuries of rather favorable and benign climate that contributed to relatively consistent improvement in agricultural production into a new century characterized by uncertainty and climate change. In this complex reality, graduates must become adept at problem identification and develop a capacity to look for solutions to root causes as they design future systems, and not be satisfied with learning menus of practices and band-aid type solutions. Focus on current practices may help solve today's location-specific challenges in local fields and farms, but will not prepare students to understand conditions in other places that are each unique in natural resource endowment, economy, and culture. It is essential to focus on whole systems, and also informative to learn from other areas of the globe where similar problems may have been confronted and solved in the past, and identify clues to help solve future challenges that will face us in the Midwest and across the globe. We surveyed students in three undergraduate agronomy courses – Soil Resources, Resource Efficient Crop Management, Agroecology – to evaluate their opinions on international content and examples used by instructors. We found that students identify easily with the basic content of courses, and many

find examples from both the Midwest agroecozone and from other countries to be valuable for their learning. There is some pushback from local students on the examples from tropical zones, with concern that they will never need this information. Students in agroecology are involved in project work that is focused on current and emerging global issues facing agriculture and food systems in a complex global system and context of changing climate. We will use our observations in class and qualitative survey comments to further broaden the scope of undergraduate courses and make them as relevant as possible to the backgrounds and interests of today's student population who will be working in a century of change.

Introduction

Colleges of agriculture successfully address the principles of science that lead to development of appropriate technologies, and more importantly the applications of information and practices in farming systems. Yet due to lack of broad geographic experience by some teachers, or demands by students for ideas on how to improve today's systems which are close to their personal comfort zones, we often focus on Midwest examples that are most appropriate to systems practiced where we live and conduct research. International students come to our state to learn about U.S. agriculture, and although focus on the local agroecoregion may allow us to share knowledge and examples from where we have the most experience, it may not be the most useful for many students who recognize the need to prepare for careers in a globalized future. Even though many graduates will farm or be employed in the agricultural industry in the Midwest, it is important for them to be aware of crops, systems, and farming methods in other parts of the world and how these impact demand and prices of commodities.

An early call for agronomy students in the U.S. to learn more about agriculture elsewhere and to consider international careers was published by Murray Milford (1969). Due to our somewhat 'parochial' focus on predominant systems in our own states or the Midwest ecoregion, our experiences may not result in an optimum approach to education, if we only use examples that are well-known to our in-state students but are quite unusual to students from other countries and ecological zones. Students from developing countries may find that much of the training and education is not highly relevant to their home situation in terms of resource availability and infrastructure, plus differences in soil types and cropping systems (Cashman and Persons, 1988). Foreign students in the U.S. can broaden experiences here through internships, choice of relevant research topics, and exposure to perspectives of multiple disciplines (Cashman and Plihal, 1987). We ask whether it would be more valuable to learning for both resident students and those from outside if we provide exposure to ideas and examples from other parts of the world in our undergraduate courses? Such examples provide a richness of experience that could help all students appreciate some of the larger issues of our time, such as widespread nutritional problems, food loss and food waste, and the complexities of global trade which often results in winners and losers. We further ask if it could be valuable to introduce these global challenges early in undergraduate courses, to help put our education into a broader context than merely contributing to local production agriculture?

The 'myth of exceptionalism' has come to be challenged in many fields (Hodgson, 2009). In agriculture, an important contemporary reality is the all-too-common feeling among most local students that the U.S. is somehow at the pinnacle of efficiency in terms of varieties, cultural practices, and marketing systems. There are reasons why we have evolved into an industry with large farms, specialization in crops and animals, and monoculture planting systems that maximize return to labor, seen as a source of pride for many students from the farm. The down side is an unfortunate attitude of many students in the U.S. about our 'exceptionalism' in high technology agriculture, as well as other sectors of the economy, and an absence of curiosity about how much there is to be learned from other countries and cultures. Many students in the U.S. Midwest are quite isolated due to lack of opportunity to travel, unfamiliarity with other peoples and cultures, and even an indifference to challenges of people elsewhere (Mason et al., 1994; Wingenbach et al., 2014).

Multiple reports in the NACTA Journal describe the paucity of knowledge, lack of interest, or limited prior experience that U.S. agronomy students have about agriculture in other parts of the world. A survey by Mason et al. (1994) revealed limited appreciation of crops and cropping systems outside the U.S. Wingenbach et al. (2014, p.55) observed that students in agriculture chose "to distance themselves from learning about globally relevant topics and issues" in part because of the complexity of systems and wide diversity of crops, production niches, and problems facing farmers in other places. Limited travel and experiences in other countries or cultures by our Midwest students result in a low level of understanding of crops and systems elsewhere (Chang et al., 2013). The growing importance of global agriculture and trade compels teachers to help prepare students for working in international research and education networks (Connors, 2004). There have been workshops and other orientation activities for faculty to try and increase the content of information and examples from other places (Chang et al., 2013; Denman et al.,1999)

With a large number of students from Rwanda studying at the University of Nebraska for undergraduate degrees in various agricultural disciplines, we have become conscious of the need to develop a more holistic geographic approach to our teaching. We question whether the course content and examples are relevant to students from other agroecoregions, while maintaining needed focus and relevance for our domestic students. We have reflected on the content and examples in three courses in the department –soil resources, resource efficient crop management, agroecology, and asked ourselves if we include materials relevant to the wider student demographics in today's courses? A brief survey of students was conducted in Spring 2019 to evaluate their opinions on both content and examples in the courses, and whether they consider current course materials valuable for their futures. Results of this qualitative study are presented. Another relevant question is

whether the cohort of students from Rwanda could be used more effectively to help our Midwest students gain a broader perspective of agriculture in a tropical agroecoregion, an open question that could be extended to explore how we might embrace the talents of all students from outside the Midwest to enrich our learning landscape.

Methods

Specific content and methods in three agronomy courses

1. Soil Resources (AGRO 153, SOIL 153, HORT 153)

This introductory course, mainly for first-year undergraduates, includes about half agronomy and horticulture majors and provides a 'service course' for others in natural resources, entomology, plant pathology, animal science, agricultural education, and additional majors. The course is focused on a general introduction to the nature and properties of soils, soil fertility and management, and soil/plant/animal/climate interactions. Topics include characteristics of soils in relation to appropriate uses and protection, different classes of soils and their geographic locations, and identifying soil properties and production capabilities. Similar to most university courses today, the learning methods include discussion, assessment, planning, problem-solving, writing, and project presentations involving all aspects of soils. International dimensions include examples from oxisols and other soils that are prevalent in many parts of the tropics and the unique challenges they present in soil fertility. An example used to illustrate transformation in land use is deforestation in tropical countries where rain forest is being eliminated to plant oil palm and annual crops for export. There is one lecture period of 50 minutes and two laboratory sessions of two hours each week, and 148 students (plus another 11 online) enrolled in Spring 2019.

2. Resource Efficient Crop Management (AGRO 204, HORT 204)

The first course in integrated crop management is taught at the second-year level, and attracts a wide range of students beyond agronomy and horticulture. It includes the integration of principles of crop and soil science, plant breeding, climatology and integrated pest management in the development and evaluation of crop management practices. Details from the application of science in farming include efficient use of solar radiation, water, nutrients, heat, carbon dioxide, and other resources in field crop management. There is a conscious effort to make this a truly systems-oriented course with wide application to a range of agroecosystems, and to recognize the importance of site-specific practices and management to minimize the need for purchased inputs and make the best possible use of local, renewable resources. With low commodity prices in the U.S. at this time, there is definite interest for local students in looking at alternative practices that can lower production costs, and diversify crop enterprises and integrate animals into systems, plus add value to crops on the farm and in the community. The instructor brings a wealth of experience in agricultural policy, thus broadens the focus of many practices and farming decisions to include issues far beyond the farm gate. Examples in class are drawn from a range of agroecosystems outside the U.S. Midwest. There are two 75-minute combined lecture/discussion/ activity sessions each week, with 113 students in Spring 2019 divided into two sections to promote better interactions.

3. Agroecology (AGRO 435, HORT 435, NRES 435)

Agroecology is a fourth-year capstone course that explores complexity, resilience and future directions of farming and food systems. Emphasis is on holistic thinking and systems evaluation, innovative production of diverse enterprises using local inputs, economic diversity on the farm and rural communities in an unpredictable climate and marketplace. Unlike many production-oriented courses, there is attention to environmental impacts of systems and social implications of changes in agriculture, allocation of cereals for food/feed/fuel, and changes in human diets and food systems. A semester-long series of team projects are used to explore emerging issues in farming and food systems that will impact food production success and global hunger through this century. Evaluation of systems is based on production, economic viability, environmental impact, and social sustainability of rural families, communities, and landscapes with a long-term perspective. International examples are frequently used to illustrate application of science in different agroecoregions, often based on the instructor's long-term research and teaching in Asia, South America, and Europe. The course has three 50-minute sessions each week that include lectures from the instructor and visitors, as well as in-class discussions. The class of 82 students in Spring 2019 was divided into two sections to facilitate better discussion.

Agronomy course survey

A one-page survey on course content and examples was given to students in the three courses near the end of the Spring 2019 semester (Appendix A). This included simple demographics of students: which course they attended, major field of study, concentration, year at UNL, age, and city/country where they grew up. There were ten questions evaluated on a Likert scale from 1 (strongly disagree) to 7 (strongly agree) to each question. Response rates were 91% in the soils course, 67% in the crop management course, and 68% in the agroecology course. The objective was to take the pulse of students with regard to learning styles, level and clarity of technical content, applicability of examples to both temperate and tropical agroecoregions, and perceptions of relevance to future study or employment. The survey was optional, and students were given extra credit points for completing the task. There was no identity of individual students, thus the exercise was anonymous. From the nature of the questions, we did not consider these to be threatening in any way, and we were advised by the Institutional Review Board (IRB) that it was not necessary to obtain an approved project number; authors Francis, Young, and Basche have been certified for conducting human subjects research and all appropriate guidelines of the IRB process were followed. Since the survey was optional, it does

not represent a complete picture of the student population in each course. In the agroecology course, for example, it was administered by an outside person at the start of class during the last week of the semester, and it appears that not enough time was allowed for many students to include meaningful comments.

Of the ten questions, only four were evaluated and results presented, as these were most relevant to the international dimensions of these courses:

3. Examples from temperate zone agriculture are useful to learning
4. Basic principles are the same for all agroecozones
8. Examples from tropical agroecozones are useful to me
10. Learning from other countries/agrozones is important

We compared the students from two groups: those from U.S. who were mostly from Nebraska, and those from other countries who were mostly from Rwanda. Results from each course and four questions are presented below.

Teacher reflections and qualitative observations

Reflections on the engagement with international topics are summarized from conversations among the instructors of these three classes, exploring their observations in class as well as performance of students on exercises that included a global dimension. In addition, a number of comments from the open-ended questions on the survey are presented to illustrate level of interest and the degree of relevance students put on the international dimensions of each course.

Results

Specific content and methods in three agronomy courses

In the soils course, instructors report that most concepts and tools can be universally applied and are relatively easy to grasp, especially such obvious issues such as soil erosion as a response to tillage in the spring and lack of ground cover for some weeks. Others such as bulk density of soils are more difficult to understand, depending on students' backgrounds in other preparatory topics. Students mentioned that differences in parent material, landscape age, and climate between temperate and tropical areas were interesting topics, and that mixing the groups with people from temperate and tropical countries in discussions provided opportunity for valuable exchange of ideas. Students with practical farm experience in the Midwest could explain the management of deep and fertile soils in this temperate zone, while students from tropical countries described the potential for erosion where there are steep or even gentle slopes and a monsoon-type climate. They also compared issues related to farm and equipment size, diversity of crop species and degree of specialization, and crops produced for food versus those for fuel or livestock feed. In the tables with mixed groups of students, there was often discussion of differences in specific farming practices as well as historical reasons for crops and farming systems for food or export. Instructors report that this interaction sparked interest in the ideas of others in each group, and raised new questions that represented an emergent property of the cross-cultural discussions, a hoped-for but not anticipated result.

In the crops course, the instructor reported substantial interaction between local and international students during the discussions of topics around the small tables, where students were specifically mixed to enhance exchange. Although the course content was primarily illustrated by examples from the temperate zone, commodity crops in Nebraska, there were some specific rotation and cover crop examples from the tropics included to broaden the perspectives of students. IPM examples from both temperate and tropical agroecozones were included, with cultural, mechanical, chemical, and rotational options introduced. One example of intercrops with banana was used so that a crop or at least a product would be familiar to students from a range of geographic backgrounds. Interactions between local and international students were generally congenial, and teams around the discussion tables dealt together with issues such as crop water needs in a seasonal environment such as Nebraska versus a pattern with two rainy seasons in Rwanda. There was a simulation exercise focused on multiple crops per year, a dominant pattern in the tropics, which was the 'comfort zone' for students from that region, and a 'mind stretch' for those from Nebraska. Examples of intercrop systems were familiar to students from Rwanda, and totally new to those from the temperate Midwest. As with any type of group work, some student combinations worked well while others suffered from differences in motivation, respect for deadlines, and interest in going into depth in projects compared to doing the minimum to complete the task for a grade.

In the agroecology course, the instructor observed that domestic students had little understanding of tropical crops such as banana, papaya, cassava and sugar cane, and learned about management from students from tropical places. Conversations often revolved around production efficiency, with Nebraska students extolling the virtues and efficiencies of larger farms and specialization, while at the same time lamenting the low commodity crop prices that made it difficult to break even at this time. Our domestic students also described the difficulties for beginning farmers to find land, acquire the needed equipment, and be able to operate on the scale they consider necessary to make an operation profitable; at the same time, they recognized the down side of large-scale farming that has depopulated the countryside and rural communities. In contrast, students from Rwanda where average farm size is about 1.5 ac (0.6 ha) are convinced that farms must consolidate to reach an efficient economy of scale. Because Rwanda has a population of over twelve million in a country about the size of Vermont, land is also scarce and difficult for young farmers to access. Most important for both groups is understanding the difference in ecological and economic conditions. They learn to appreciate the uniqueness of each local situation in terms of soil productivity, economic goals and price realities, environmental impacts, and social goals of the farmer and family. These all fall under the umbrella of

agroecology.

Two interviews of stakeholders were conducted by each student as requirements for the class, one with a farmer and another with someone active in the food system – retail or wholesale, restaurant, processing, or food service in an institution. Several Rwandan students chose to interview a person from their country, and others to interview Nebraska farmers or others. A keen interaction and thoughtful report from most students indicated that this was a valuable cross-cultural learning experience, and generated valuable discussion in class when the reports were presented.

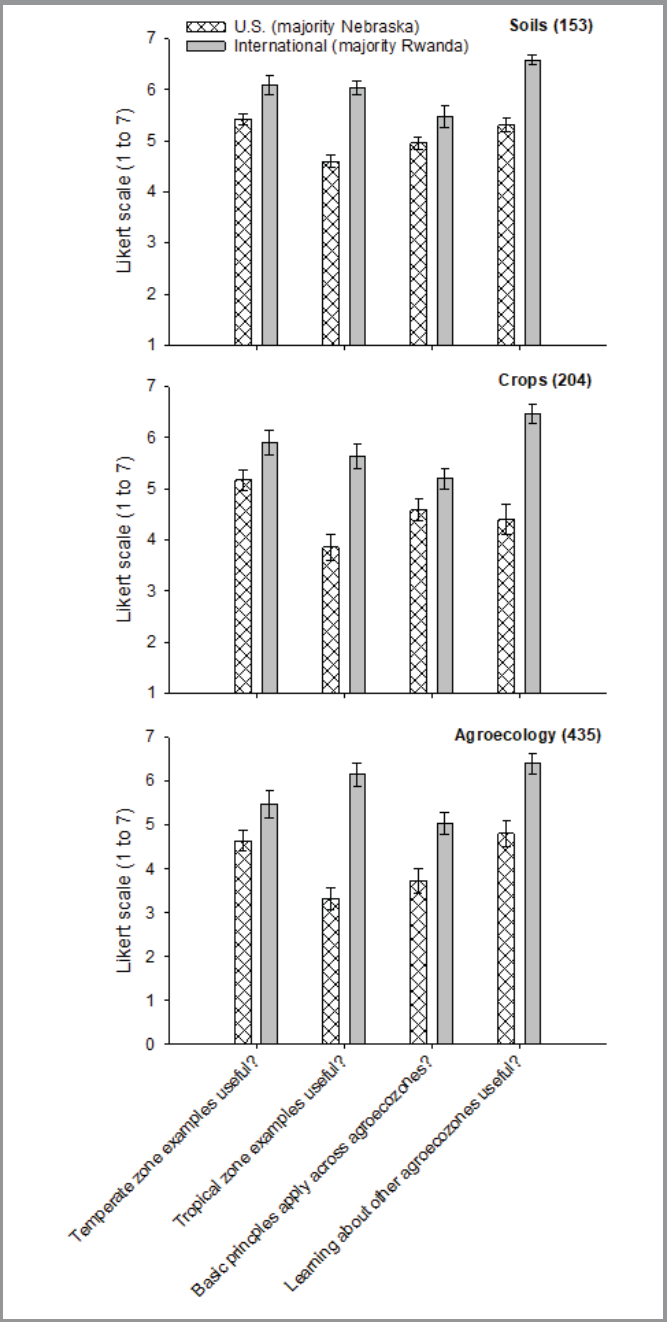
A major emphasis on broad challenges was included in the global issues project topics that small student teams addressed throughout the semester. This year the topics were i) use of transgenic crops, ii) solving food loss and food waste, iii) increasing crop/animal system integration and efficiency, iv) comparing animal vs plant protein sources for humans, v) equitable distribution of global food production, vi) water challenges, quantity and quality, vii) optimum farm size in different agroecozones and countries, viii) solving undernutrition and obesity challenges, ix) allocation of cereals for food, feed, and fuel, x) meeting global phosphorus needs in the future, xi) food sufficiency, security, and sovereignty, and xii) potentials for ecological intensification. Teams discussed the key issues under each topic, then students submitted a complete individual sub-topic report. At the end of the term, the teams had 25 minutes to present their overall topics to the class and generate interaction. Some reported in their final reflections that this was one of the best opportunities to work with each other across cultural boundaries and to share the challenges as they related to U.S. and Rwandan [and three other countries] conditions.

Results of course survey

Across the three courses, 266 students responded to the one-page survey on course content and teaching methods. Results are presented separately for each course in Figure 1, and there were significantly higher Likert scores from international students than from U.S. students for each of the four questions in each class. Since responses were similar across the three student class groups we discuss them together. Results in the figure indicate that:

- Both U.S. and international students moderately agreed that temperate zone examples were useful to their learning, although international students rated these about one point higher than U.S. students (Q. 3)
- U.S. students were indifferent or slightly disagreed that tropical zone examples are useful, while international students rated them about two points higher for learning (Q. 8)
- All students seem somewhat unsure about whether basic principles apply across zones although international students rated this about one point higher than U.S. students (Q. 4)
- International students agreed more that learning about other agroecozones was important compared to U.S. students (Q. 10)

Figure 1. Mean Likert scale scores



(1=strongly disagree to 7=strongly agree, ± one standard error) for student survey responses related to international agriculture across three undergraduate courses at the University of Nebraska – Lincoln in spring 2019: top figure includes students from Soil Resources (n=134), middle figure the students from Resource Efficient Crop Management (n=76), and bottom figure students from Agroecology (n=56).

Without many written comments we can only speculate on the reasons behind these differences, but from personal conversations with students, body language, and comments during discussions we propose some explanations. From prior experience with students from other countries and some first-hand teaching in other cultures, we know that international students are less likely to question their instructors than those from the U.S, who showed consistently lower levels of agreement on all four questions.

U.S. students consistently found examples from the tropical zone to be less valuable for learning than examples from temperate zone examples, a result not surprising since few have traveled, and many seem less interested in class when these examples are presented. International students have already made the 'cultural jump' in coming to Nebraska to study, and appear to embrace examples from both regions. In fact, they come here to learn about temperate zone systems and expect to hear mostly examples from their instructors who have personal experience here. There was a clear difference between the two groups in desire to learn from other places, with international students scoring significantly higher Likert scale values on that question.

Any comparison between the three courses is confounded by the predominant academic level of the students (first, second, and fourth year), the academic discipline of each instructor, different instructors in each class and their personal experiences, time of day the courses were taught, and length of the class sessions. Thus we did not compare courses, and results were similar. In each course, students are seated at round tables of four to six people, which greatly facilitates small group discussion and collaborative exercises.

Similar to other surveys of teaching and learning methods, students in these three courses value practical and hands-on activities, with varying levels of appreciation of lecture-style presentations (quantitative data not presented). Similar to other results, lectures are often rated below practical activities that engage students in problem solving or case studies (Freeman et al., 2014). A consistent set of comments across the three classes, from both domestic students and those from other countries, was that hands-on learning provided the most valuable method for learning about soils, cropping systems, and agroecology. From personal comments we hear from students, the international students appreciate the open discussions and practical nature of these agronomy courses, and many of them come from academic cultures where the modal method of instruction is lecture and evaluation by examination. Data from relevant questions on the survey related to learning methods will be reported elsewhere

Comments from students on class survey

We note that most of the comments on the surveys came from the last, open-ended invitation on 'more comments on how to improve this course', which may explain the prevalence of negative and specific ideas on content and teaching methods. In the examples of comments given below, there was some interest from local students in the soils and crops in other places, but also some 'push back' from others who felt the course should focus on local soil conditions.

1. Comments from students in AGRO153 (soils course):

"If possible compare soils from different countries around the world and show what's similar and different." [Fisheries and Wildlife student from Nebraska]

"Talking about local Nebraska soils, being from Nebraska, it made it more applicable for me." [Supply Chain Management student from Nebraska]

"We spent lots of time on Nebraska soils which is helpful for local students, but remember that there are out-of-state and foreign students." [Environmental Restoration student from New Jersey]

"I am interested in how our practices compare globally." [Fisheries and Wildlife student from Nebraska]

"This class will be extremely useful for me and my thesis, but others seemed to have low engagement due to lack of connection with future applications." [Natural Resources student from Georgia]

"Half the students in class are from Rwanda, and I am from another state; Nebraska is not the entire world, and everything is global now." [Plant Biology student from Wisconsin]

More time spent on areas outside of just Nebraska would help me see the bigger picture [Fisheries and Wildlife student from Nebraska]

"Not all places are like Nebraska, and we need to learn to think outside the box." [Wildlife and Fisheries student from North Carolina]

2. Comments from students in AGRO204 (crop management course):

"We didn't come to Lincoln to learn about other countries when we came to expand our knowledge on farming in Nebraska." [Agronomy student from Colorado]

"Learning about other countries and agroecozones was not relevant." [Agribusiness student from Nebraska]

"Examples from tropical agroecozones will not affect the choices I will be making in the future." [Agribusiness student from Nebraska].

3. Comments from students in AGRO435 (agroecology course):

"I want to learn about commercial agriculture here because it is relevant to me." [Agronomy student from Nebraska]

"Agriculture is increasingly a global enterprise, and it is good to learn from other places." [Integrated Studies student from Rwanda]

Discussion

Across the three classes at 100, 200, and 400 levels (with most students in first, second, and fourth years of university) there were differences in complexity and breadth of topics presented. In Soil Resources (AGRO153) the focus was on basic understanding of soil types, fertility, biology, and management effects. Although the majority of examples were from local Nebraska soils, topography, and agroecozones there were some specific cases from tropical soils to build understanding of the effects of parent materials, ages of soils, temperatures and rainfall patterns that have shaped soil formation in these different geographic regions. Based on student comments, there was an appreciation of the importance of looking at differences in soils across different continents as part of students' broader needs for future jobs.

In Resource Efficient Crop Management (AGRO204) there was integration of crops and soils information in the study of systems design including crop choice and soil management. Students focused primarily on major commodity crops in the state and the predominant simple crop sequences, especially the most prevalent maize-soybean two-year rotation. Potentials for diversification with other annual crops and longer-term rotations with perennial crops and pastures are introduced, and students perform relatively simple production and economic analyses of different systems. The content is further expanded by some examples of intercropping in tropical agroecozones, typical systems in the humid forest zone that are not known to most domestic U.S. students. There was some pushback from Midwest students about these diverse systems topics, as they could not see the relevance to their programs now nor to their future jobs. International students (many from Rwanda) were happy to have their local systems used as examples, including tropical crops and the multiple crop systems in which they are commonly grown. To make these examples more relevant it may be important to introduce the topics differently, and thus to build interest in the likely future potentials for mobility as students become professionals in the global agricultural arena.

In Agroecology (AGRO435) the capstone course content is both more comprehensive and broader in scope, going beyond production and economics to embrace environmental impacts of different types of systems as well as social forces and consequences of alternative systems. Among the complex topics discussed are impacts of farm size and political decisions including focus and level of farm subsidies and long-term political and climate change. Because of the instructor's long-term experience in Philippines, Colombia, and Norway, there are many international examples included in the course, both from temperate and tropical agroecoregions. These elements of the course content were generally embraced by both local and foreign students, although there was some pushback about relevance of tropical examples to Nebraska students who do not see their careers moving far beyond the state's borders nor the Midwest.

In terms of course activities to promote learning, there was a universal opinion that practical examples, case studies, discussions, and hands-on learning were favored over lectures (consistent with Freeman et al., 2014). A frequent suggestion was to include more field trips and direct involvement with crops, soils, and cropping systems. There was general appreciation by students in all three classes for our including a range of different learning activities. Students suggested that more small group discussions would be useful for them to exchange experiences with people from other agroecozones, and recognized that not everyone is comfortable sharing ideas in small groups. Students valued guest speakers from other specializations in our Agronomy and Horticulture Department, as well as from outside departments, and considered this one of the best activities for learning (in AGRO 435). As we have learned over the years, the team project assignments get mixed ratings; some students are concerned that they will have to do more than their fair share of work, and may be evaluated based on other less-motivated student's contributions to the group work. But generally the teams that included students from the Midwest and those from other countries found discussions and project work to promote a valuable sharing of information and meaning, and several have described how people from another ecoregion enriched their experiences in the agronomy courses surveyed.

Conclusions

Bringing information from a wide geographic range of sources, and providing venues where students can learn from teachers, from students from other parts of the world, and from farmer stakeholders will help prepare the next generation of agronomists. Many of them will practice their specialties but also develop capacities as generalists to be able to see the whole picture and put solutions into context. As teachers, we are challenged by this large task and compelled to introduce information and examples from a wide range of climates and socio-economic situations that will help prepare our students for a century of change. There is a mixed reaction to the international dimensions of courses in Agronomy, with some embracing the challenge and reporting that diversity in the student demographic was a positive factor for their learning, while others were less convinced that this was important. We should note that some undergraduates who are pushed out of their 'agronomic comfort zones' that involve corn, soybeans, and wheat, as well as continuous corn or corn-soybean rotations, have difficulty seeing the value of cropping diversity, adding value on the farm, or taking a whole-systems view that is different from what they have learned in other courses. Thus it is not surprising that these same students put less value on interactions with students from other countries and on information and examples from the tropics. In our opinions, the students from other agroecozones different from those in Nebraska and the Midwest could provide much more from their experiences in other countries. Some do not feel comfortable sharing due to language challenges, while others feel that time preparing for even short class presentations on their home country crops and systems takes time away from their major goal to finish a degree

and return home. It is a challenge for us to design a reward system that will be attractive to getting foreign students involved in sharing experiences, as today they could be considered a valuable and untapped resource to broaden the perspectives of our local Midwest students. We observe that this emphasis on international agriculture is a current need for all students, and it is up to us to find the best ways to organize and catalyze interactions among students that will help us build this dimension of the local learning landscape.

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Global Perspectives Enrich Learning in a Graduate Agroecology Course

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Abstract

Agroecology courses focused on sustainable farming and food systems emphasize reliance on local renewable resources and conditions, and on nearby markets. Today these systems operate within a globalized food system, and farmer decisions are impacted by food imports and prices, plus weather and political conditions elsewhere. In the Norwegian Agroecology M.Sc. program, student teams engage with farmers and food systems stakeholders to envision goals and future directions, recognizing how local systems decisions relate to global realities. Students requested more attention to global-local linkages, and their initiative led to more economic and social dimensions in our curriculum. In 2018 they selected topics in policy issues and global economics; environmental impacts of farming/food systems; gender and other social issues; urbanization and land use; future agricultural production methods; and land and labor questions. International breadth becomes important because many students choose thesis topics with biophysical and/or socioeconomic dimensions in other countries where conditions are different. From student feedback and discussions we are convinced that exploring global perspectives in the M.Sc. curriculum prepares graduates to function well in a future with local and global focus. We report student opinions, teacher observations, and future curricula with even greater emphasis on international dimensions of agriculture.

Introduction

Importance of Global Perspectives

Today's students in agriculture need to understand complexity that goes far beyond crop production practices and animal enterprise management, topics that often occupy a majority of time and focus in current 'how-to' courses. In the current farming context, decisions made at the farm and community levels are often impacted by larger issues as complex and far-reaching as tariff battles over export commodities, withdrawal from regional trading agreements, world prices, currency exchange rates, global climate change, and loss of biodiversity. Future researchers, teachers, and other decision makers need to understand inherent and often incommensurate stakeholder goal conflicts and be prepared to help clients sort out complicated priorities as they interact with farmers and food system specialists, as well as with people from industry, government, and non-profit development agencies.

To make sense of complex challenges, students are encouraged to adopt a holistic approach and embrace a global perspective as they prepare for careers in education, research, farming, advising, agri-business, or related pursuits. The agroecology study program also includes integrating basic and applied sciences such as plant physiology, genetics and plant breeding, pest management, engineering technology, and economics. In the agroecology M.Sc. degree program at the Norwegian University of Life Sciences, the goal is to support learning through educational activities that help students deal with issues interconnected among ecological, economic and social perspectives, as well as across different spatial and temporal scales (Lieblein et al., 2008). To help enrich their appreciation of spatial scale and uniqueness of different places, we have incorporated opportunities for gaining a wider international

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perspective. In this paper, we describe why we see global issues as relevant to local systems, how class assignments are designed and completed, and how students evaluate what they have gained by embracing and internalizing the international dimension of the program. Observations by instructors and their expectations for increasing global relevance of the agroecology course are presented to complement those of students.

Context of Agroecology M.Sc. Degree Studies in Norway

The first semester of a two-year M.Sc. program in Agroecology—defined as the ecology of food systems (Francis et al., 2003)—at the Norwegian University of Life Sciences annually attracts 20–25 students to a full-time introductory course (Lieblein et al., 2012). Local context is established with practical learning activities on Norwegian farms and in local food systems; these provide shared experiences and allow reflection using relevant theory and methods from phenomenology (Østergaard et al., 2010), starting with experience on the farm. Student teams interview farmers, work on farms, dialogue about owner's goals for the future, and together with farmers develop action plans to help reach those goals.

While learning about the food system, students interview relevant players in municipal canteens, local schools, county government, retail trade, and processing, as well as people in urban agriculture initiatives and those managing nearby farms (Lieblein et al., 2008). From these contacts, the students derive a composite picture of the community's goals, in some cases a move toward more organic or local food. As with the farm cases, students meet with key players to collaboratively envision a path toward the future to reach their common objectives. As a part of the team learning endeavor, students observe and participate in the system, dialogue about components and interactions with stakeholders, reflect on meaning and implications, create visions and action plans to realize them, and practice the process of inquiry and research in farming and food systems (Francis et al., 2016). Although they are focused on individual farms and communities, discussions necessarily take place within the context of driving and hindering forces (Burnes and Cooke, 2012) in both local and global agriculture and food systems.

International topics are enhanced by having students in the class with diverse farming and food backgrounds and varied prior experiences. Faculty with more than 20 years research and teaching experience outside their home countries, plus professional experience with farmers and students in more than 50 countries, bring their own rich backgrounds to course topics and field examples. We promote learning the capacity for moving across a spectrum of spatial scale, from field and farm to where this fits in the landscape as well as the region and the global scene, and across the temporal scale from historical roots to present realities, a capacity called 'flickering' (Bland and Bell, 2007). Especially important is visioning for future options and opportunities. In this first semester we explore global-local linkages, with topics chosen by student teams, and within which both farming and food systems operate.

To help students obtain a holistic understanding of the current situation, we catalyze a systemic consideration of ecological, economic and social dimensions and their interactions. In many universities, the whole systems focus is not systematically applied by many discipline-oriented colleagues, and by extension their students. Our program brings rigorous academic methods to systems education and research, using case studies including qualitative, quantitative, and mixed methods. Diverse backgrounds of students present a challenge in designing the learning landscape, but they add a richness to the discussion that contributes to everyone's learning.

Students often opt for conducting thesis research outside their home country, providing another international dimension to the M.Sc. program. Some students choose jobs after graduation or continue post-graduate studies in other countries, often a result of contacts established during the course. The methods used for including global perspectives and our perceived impacts of each on learning are explored in more detail, both from the perspective of instructors and from opinions expressed by students who have described their satisfaction with this dimension of the program.

Methods for Incorporating Global Perspectives

Agroecology class student composition and prior international experiences.

In the cohort that begins the M.Sc. degree program each autumn, 20 to 25 students come from at least ten countries. Their unique mix of mother tongues, additional acquired languages, and cultural experiences are shared throughout the semester. Individual student's prior education includes agronomy or soils, horticulture, plant protection, rural sociology or anthropology, political science, geography, natural resources and more. There is not only a wide range of disciplinary backgrounds but also differences in the way these topics are taught in their prior university experiences. Students also contribute examples from a wide range of international travel, volunteer, and job involvement to the learning community. At least half of the students have previous work and intern experience in growing crops or raising animals and share this knowledge during class discussions, farm visits, and farm project activities. Communication among students infuses their international experiences into discussions, helping create an 'international learning community' that broadens perspectives and practical applications in agroecology education.

Shifting focus between farm, local food system and realities of global markets

In the introductory agroecology semester, the concept of 'flickering' is introduced (Bland and Bell, 2007), which means developing a capacity "to continually switch back and forth between the perspective of the part and the perspective of the whole..." (p. 290). Often the parts and the

whole are at different spatial scales, but not necessarily. They may be called systems, sub-systems, and supra-systems. An example is considering maize yields in a given season and field, then quickly shifting focus out to maize yields in other countries and growing regions, and how these impact each other. Another example: a farmer is thinking about buying a larger and more efficient tractor and planter unit to more quickly complete timely spring seeding; they may 'flicker out' to consider life-cycle costs to manufacture that tractor; then they may 'flicker back in' to think about opportunity costs for the saved time or potential to use a larger machine to do custom work for neighbors; lastly they may flicker out to the global level to consider competitiveness of cereal production in the North with that in the South as influenced by tractor size and labor costs. We introduce the concept as one tool for students to use as they pursue with clients the visions for improved future farming and food systems. These are extensions of Checkland's (2000) soft systems methodology.

Global–local linkage topics chosen by students

Students suggested that we devote more time and energy to establishing local-global links in our farm projects and food system projects. Some connections are intuitive and obvious to farmers, such as cereal prices received at the local cooperative tied to global prices set by the Chicago Board of Trade. Students chose topics they considered important from local to global levels, those that could impact their discussions and plans with clients in the team semester-long projects on farms and in food systems. Student teams researched six topics and later presented a summary and led a class discussion. Topics are described in the results section.

Choice of thesis topics for research in other countries

In preparation for the thesis, students are provided wide leeway to choose a topic of interest, based on prior experience or strong personal relevance, or one that will provide an opportunity to live and work in another country and culture. We encourage choosing a topic that aligns with their concerns for future farming and food systems, and especially to help them leave personal 'comfort zones' to explore challenges in a new context from their prior experiences. In semester two there is a course on thesis proposal planning, and one on research methods, both available on campus at NMBU or accessible online. These courses are crucial to introduce planning of research and practicing methods for data collection prior to entering the field and conducting their own research project, either alone or as a member of a larger project team. Currently, all students can apply for thesis travel and expenses. Several students have pursued topics in developing countries as part of other projects funded on campus in Norway in Plant Science, Animal Science, and other departments. We urge students to begin planning their thesis topics and doing preliminary reading as they take the mandatory thesis proposal and research methods courses.

Future employment of students in universities, non-profits, and food system projects

During choice of thesis topics and project field activities, we urge students to consider how their potential for future employment will be enhanced by learning more about farming in other agroecoregions and about alternatives to current, globalized food systems. Options include local food production, community processing, local marketing options such as direct sale, farmers markets, cooperative food clubs, urban agriculture, and community-supported agriculture. In learning and practicing the systems approach to the study of farming and food, students will be better prepared to work in a wide range of areas including research using participatory methods in farmer cooperatives, non-profit development organizations, government agencies, and educational institutions dedicated to improving access to food and healthy nutrition.

Results and Discussion: Global Focus in Learning

Agroecology class student composition and prior international experiences.

Given a class of students with a wide range of prior educational experiences, including biophysical and socioeconomic disciplines, there is a challenge in how much depth can be achieved in any branch of natural or social science. With our focus on whole systems, their structures and functions and relationships between parts and the whole, we consider the diversity of what students bring to the learning community to be an asset for building teams, establishing a holistic view of approaching complex challenges, and linking to experiences in the international context. One challenge for students is gaining an appreciation of holistic studies in farming and food systems as a legitimate and rigorous academic pursuit. Rather than lament lack of detail in any specific area, we celebrate diversity and promote a focus on large issues that challenge sustainability of farming and food systems in the long term. Focus includes diversity among people and challenges, as well as diversity in ecozones, cultures, diets, and crop and animal systems. It extends to how we think about, discuss, and plan ways to deal with increasingly unpredictable and changing weather and climate. International experiences of students and teachers is a strength in our learning community.

Shifting focus between farm, local food system and realities of global markets

As students construct rich pictures of individual farms and community food systems, they focus primarily on immediate forces just outside the chosen boundaries of each system under study. Many are relatively local influences such as weather, landscape and environment, food prices, and how farm products move through the value chain to consumers. Yet teams quickly recognize the impacts of forces far beyond the county, region, and national boundaries. Examples include an appreciation of how short-term extreme weather events elsewhere in the world affect local prices for commodities, and how budgets for food in a school are impacted by costs of imports into Norway.

We see this capacity for identifying connections across spatial scales to be valuable as students build a context for thesis work and future job opportunities. Based on these examples, we think it is clear that gaining a capacity for shifting focus from field and farm to global markets, or from the local price of grain to world commodity prices over the next decade with climate change and unpredictable energy costs, becomes relevant for students.

Global–local linkage topics chosen by students

We summarize here the results from six student presentations on global-local topics in September, 2018. Table 1 provides a summary of the topics and key results. References to data presented are not included, as these are readily found on the internet or represent general knowledge today.

Policy issues and global economics

This team explored key contemporary issues including food distribution, power shifts and concentration of ownership, price supports and tariffs, and government influences on food consumption. Food distribution impacts freshness and nutritional quality, as long travel distances and fossil fuel costs are part of the globalized system. Complications include weather, lack of local infrastructure, and short-term economic issues such as sanctions and tariffs. A global push toward 'free markets' results in winners and losers, and information dissymmetry promotes monopolies and even greater inequities in availability of food to those who are hungry. What is often called the 'food chain' is strongly impacted by industrialization of agriculture, and has grown in importance due to innovations in refrigeration, chemical additives, bar code ID systems, and the internet. A large power shift from farmers and local markets to processors and distributors adds complexity to food dynamics. In summary, these are all impacted by national policies and regional trade agreements, and influenced drastically by international 'dumping' of crop commodities at prices below production costs, sometimes promoted by governments to maintain market share and create a relatively stable outlet for farmers. Farms where our projects are located are greatly impacted by price supports and policy in Norway, and local food systems are influenced by global prices as well as prices for food produced nearby.

Environmental impacts of farming and food systems

Climate change, biodiversity loss, herbicide resistance in weeds, and water pollution were several key forces described by the team. Greenhouse gas [GHG] emissions have always existed and followed cyclical patterns, but current levels are beyond historical record highs and are attributed to human population and activity. Agriculture and forestry contribute 24% of GHG produced today, with 40% of this from animal production. There are multiple potential mitigation strategies that could be adopted by individuals, by farmers, and by the agricultural industry to help reverse current trends. Biodiversity adds to ecosystem services, but of 1.7 million named species there are over 26,000 threatened today. Among these are many pollinators and natural enemies for crop pests. Herbicide resistance in weeds is highest in the U.S., Canada, China, Western Europe, and Australia, countries where most chemicals are applied. Only three modes of action are used in 90% of herbicides, and little change is anticipated through research in the immediate future. Water quality problems from chemicals and excess nutrients entering waterways are difficult to detect, and improvement is complicated by multiple non-point sources of these contaminants. Today there is growing awareness and substantial research and 'clean-up' dedicated to changing the situation, and project farms practice this type of man-

Table 1. Student selected topics with global-local implications in their farming and food systems project work, plus key concerns within each topic.

Student-selected Topics	Key Concerns in Each Topic
Policy issues and global economics	Food distribution Information dissymmetry Power shift from farmers to processors National policies
Environmental impacts of farming and food systems	Climate change Biodiversity loss Water pollution
Gender and other key social issues	Ecofeminism Degrowth and right sizing operations Peasant movements
Urbanization and land use	Loss of farmland from food production Equity in access to land and food Focus on export crops
Future agricultural production methods	Tillage methods, especially no-till Soil fertility based on internal resources Crop rotations and cover crops
Land and labor issues	Changes in rural demographics, land tenure Policies and supports for small farmers Land grabs by corporations for export crops

agement.

Gender and other key social issues

Key social issues identified and discussed by the team included ecofeminism, degrowth, and peasant movements. The team concluded that there is no real solution to development challenges without equality and leveling of opportunities, and that the world is now in a third wave of collective liberation. Important factors relevant to our course are that women produce 60–80% of crops in the Global South, and that 80% of the food and profits from sales goes to family nutrition. Two success stories of promoting equality are the Zapatistas in Mexico and the Land Movement [M.Sc.] in Brazil, both resulting in a 'redemocratization of local economies'. Degrowth is a movement that started in France as an opposition to globalization, and its proponents are recognizing limits of natural resources and growing populations as central to today's hunger challenges. An emerging counter influence to the widely-accepted paradigm of 'sustainable growth', seen as an oxymoron by many in development, is the peasant empowerment led by Via Campesina and many local groups. Important elements of most programs include promoting small-scale agriculture, local food sovereignty, reducing presence and domination of agribusiness, and 're-peasantization' of agriculture and food systems. The Cuban model was described as having many attributes of 'right scaling' food production, as opposed to always scaling up.

Urbanization and land use

Impacts of global population growth are affecting land use patterns through changing social structures, health care access and human welfare, infrastructure and economic wealth, and environmental consequences of reducing land available for farming. Achieving the 'Sustainable Development Goals' of the United Nations was cited as important to assuring that land is dedicated to food production and that equity in access to food should not be compromised by concentration of land ownership and focus on export crops. Overconsumption and obesity, along with undernutrition represent a paradox plus consequent major health problems with large human and healthcare costs. Crop losses and food waste contribute to an overall lack of adequate nutrition in many countries. Poverty is a key cause of poor nutrition, and greater emphasis on food crops grown and consumed locally as well as access to land were identified as key issues. Solutions that are viable to improve nutrition and local food availability include nutrition education, urban and peri-urban food production, children's school farm programs, and raising awareness of where food comes from, how it is produced, and how smaller farms can meet local people's needs.

Future agricultural production methods

The team described alternative tillage options, different fertility practices, and crop rotations, and also explored conventional methods and why they continue to dominate the agricultural production scene. They listed conservation tillage, strip till planting, ridge till, and zero till systems as important, with indications of potential for increased carbon sequestration, reduced water and soil erosion, better moisture retention, and less fuel and chemical use in some new systems. All were credited with enhancing organic matter content in soils. Much of the nitrogen needed for cereal crops can be supplied by green manure, either from cover crops (CC), composts, or more legumes in the rotation. Resistance to using cover crops is based on perceptions of seed cost, additional time needed, possible pest increase, water use, and CC species becoming weeds. Crop rotations have been shown to improve soil tilth and soil structure, and to reduce insect, pathogen, and weed problems in cropping systems. Some reasons why conventional practices are widely used include a strong research foundation, available equipment, doing what the neighbors are doing, advertising of chemicals and fertilizers, and externalizing many costs from a farming operation. The lessons on alternative practices can be useful in building scenarios for student farm projects.

Land and labor issues

China was presented as a key example of where industrialization and urban migration have led to rapid exodus from rural areas and large changes in rural demographics related to land use. The team noted that there is collective land distribution, and farmers do not own their own land. In 2000 the ability of local governments to levy taxes was forbidden, leaving them with few resources. In 2004 they suppressed agricultural taxes, and local officials sold land to the government. Both policy changes discouraged local development of small farms and encouraged consolidation. For every one percent of people moving to cities, there are 10 million fewer in rural areas, meaning that less local food is produced and marketed in the community. One consequence of population increase and urban migration has been a reduction in arable land from 1.3 million ha to 1.2 million ha in just over one decade. Incentives for moving are clear, as the average farmworker makes 60% less in wages than someone in the city. There is limited access to health care, education is costly or not available, there is no retirement system, and little opportunity to travel for many people. So the cycle continues. In the large picture, international groups are working to reduce frequency of land grabbing by monied interests, among them Occupy the Land [Berkeley, California], and an anti-airport revolution [France] and Agrocité [Paris]. Frequent goals are increases in community gardens, micro farms, and education on small-scale production. These are initiatives to keep farms small and production closer to those who consume food.

Choice of thesis topics for research in other countries

Many of our M.Sc. students choose to conduct thesis research outside of their home countries. Several examples illustrate both research challenges and results that were useful to farmers and policymakers. One thesis project was conducted in Havana by a student from Germany with a survey and observations of how municipal wastewater was being recycled into their globally famous *hidroponico* organic food systems on small plots of land in the city. This project has expanded, and today there are successful farmer cooperatives using biological pest management and green ma

nures for compost to provide adequate nutrients for vegetable crops. A student from the U.K. studied organic cashew production for export carried out by male farmers in Tanzania, and compared resulting economic returns and nutritional impact on families with impacts of a nearby project on vegetable, fruit, and small animal production conducted by women farmers in the same villages. As expected, much more of the women's food production and value from sales was directed toward improving family nutrition (Bakewell-Stone et al., 2008). The student conducted a two-day workshop at Morogoro to promote the expansion of organic food production on a small, family scale, and the event attracted 25 eager participants.

A student from Argentina learned about emergy analysis (modified life cycle analysis based on energy, expressed in Em-joules) through courses in Sweden and workshops at University of Florida, then applied the tools to evaluate traditional cow-calf pasture grazing and rotations with conventional row crops in the Pampas Region (Rótolo et al., 2007). She expanded this work in a doctoral program with analyses of maize-soybean-wheat rotations and monoculture soybeans; detailed life cycle analysis of inputs and returns showed that Argentina is slowly exporting natural capital to other parts of the world since little processing is done in the country. Groups profiting most from an extensive national maize enterprise are international traders and input suppliers. A student from the U.S. studied the effectiveness of native legumes for N fixation in the highlands of Ethiopia. Not content with only technical data from the soils laboratory, she conducted interviews with farmers to uncover reasons for using or not planting cover crops, in order to offer advice to extension specialists on how best to promote legumes and diversity.

A U.S. student studied nutrient sources for high-quality Basmati rice production in India. She integrated qualitative and quantitative tools including farm surveys, manure products sampling, simple systems modeling, and expert panel discussion. This approach was found essential to address nutrient gaps on resource-poor case study farms, and she concluded that the strategy could be useful to address similar problems in other smallholder settings (Ditzler et al., 2018). In particular, the method facilitated systematic identification of local needs and selection of locally relevant interventions from a range of academic and extension best practice recommendations. Economic analysis showed that green manures, slurry from biogas production, and composted manure were all cost-effective and equal in effect to purchased chemical fertilizers.

These represent projects that can potentially make a difference in people's well-being, and along with many other thesis research projects have added greatly to students' capacities to conduct research under a range of conditions. Such experiences prepare them well to seek research positions or further education in the international arena.

Student Opinions About Internationalization[1]

We asked students to provide feedback on how the autumn agroecology course was useful in their thesis research. Comments they provided were wide-ranging, and in some cases went beyond the boundaries of research or future work and studies. Their words are paraphrased, with brief key quotes from each student.

A student from Argentina, 2007-2009, found that the holistic approach was useful in research as well as providing a new 'way of life'. She found the methods useful when applied in her M.Sc. and Ph.D. thesis research. This student later completed a doctoral degree at the University of Rosario and used creative environmental accounting to assess the total costs and benefits of maize production systems as well as crop rotation systems. With Argentina exporting 80% of the national maize crop before processing, others were benefiting from the system and the country is gradually exporting their natural resources in the form of grain.

"The agroecology program gave me tools so that I could cope with this complexity (in Indian agriculture), draw themes from the context, and share anything that was worthwhile to the scientific community," according to a Canadian student, 2014-2016. He found the methods from both biophysical and socioeconomic sciences to be valuable, and they made the field research both exciting and challenging. A student from U.S.A., 2018-2020 was excited about how the course and research methods helped to bridge the gap between academia and social change. She also found that "throughout the course I was encouraged to take agency in my own learning, paving a strong foundation for my research," which was later conducted in Brazil and U.S.A.

A student from U.S.A., 2012-2014, found the group work both challenging and rewarding, and said "the agroecology course gave me firsthand experience working with a small group to solve real-world challenges." The team project "resulted in an end result that was greater than just the sum of its parts, and we truly learned to discuss and work as a team." She went on to study dairy goat systems using improved genetics in Zanzibar, and after graduating returned to that country as part of the Norwegian Peace Corps to continue the research and outreach.

We asked how perspectives and tools from thesis work in another culture and environment were being used in current jobs or in further study for advanced degrees and received key comments on the value of the student agroecology experience.

The Argentinian student, 2007-2009 quoted above added that her current research benefits from "changing [from] a linear paradigm of production to a circular one," although she finds it difficult to explain this to colleagues who have not been educated in systems thinking. The tools and methods of analysis have proven valuable in her current position with the national research institute, and provide a perspective for moving from analysis of field systems to the regional level. The student quoted above, from U.S.A., 2012-2014 found that the same tools developed for interviewing farmers in Zanzibar were equally useful in an Extension position in Indiana, as she "has become a more open-minded, culturally aware person, important qualities for working effectively in a diverse workplace."

A Canadian student, 2014-2016 was invited to travel and present his thesis research undertaken in India at the final conference of the cooperation project, two years after

his fieldwork was completed. In returning to the site of his M.Sc. research, he found that "what farmers are doing there is totally different than anything that happens in the West, but with an agroecological lens, you can make comparisons and draw great ideas." He describes the push for smaller-scale farms and production in Canada, but little progress is evident and suggests that some of the successful examples elsewhere could help inform innovative and moderate-scale systems where he now works in British Columbia.

Conclusions: Directions for the Future

Enriched learning through international topics and activities in the Agroecology M.Sc. program has expanded in part as a response to student interests. The student team approach to study of global issues has been a part of the autumn semester for three years, and we continue to improve this quest to build awareness and commitment to broad issues that matter for the future. The team projects on farms and in rural and urban communities have now become better connected to global realities, as students hear from stakeholders in the field how important world commodity prices are and how local food supplies are tied to the global economy, especially in Norway where 50% of food calories and 75% of food value are imported into the country. Students report that demographics of the autumn class with representatives from at least ten countries, as well as instructors' prior international experiences all contribute to a learning landscape that extends far beyond the borders of Norway. Few results could be more gratifying to teachers in a course on participatory action research than reports that students find methods used in their class projects are contributing to valuable 'tool kits' for research in the field. Overall, we conclude that the international focus of activities in the introductory course and a climate we create for viewing issues from farm to global perspectives are helping shape these international citizens for a future of thoughtful and practical action that contributes to improving the human condition.

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Returning to Romania: Building on a Service Learning Course Focused on Enhancing Skills Used in Engagement

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Abstract

We recently developed a course using a service-learning platform to introduce undergraduate students to international engagement, agricultural extension methodologies, and dairy quality analysis. In this course, US and Romanian undergraduate students formed binational teams to work directly with smallholder dairy farmers in an effort to improve the quality of their milk. In the first iteration of the course which took place the year prior to the course described here, students conducted a quality assessment of milk produced throughout a Romanian village to better identify barriers to the farmers' developing a milk collection program. Here, we report on the second iteration of the course where students introduced practices that could mitigate the quality challenges (high total bacteria and coliform concentrations) identified in the previous class. This authentic/experiential learning platform provided a highly motivating learning environment where students reported improved dairy analysis knowledge and also the confidence

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to apply their learning to new scenarios. Likewise, dairy producers involved in the project reported an increased understanding of cleaning and sanitation. Furthermore, the farmers reported that they were highly likely to employ the cleaning and sanitation protocols introduced by the students. In addition to increased dairy quality knowledge, we also report on how the authentic/experiential learning platform allowed students to utilize behavioral competencies important to successful engagement.

Introduction

The reach of the US land-grant universities (LGU) is truly global and LGUs' international efforts span across the missions of learning, discovery, and engagement. Today, numerous LGUs have thriving international engagement programs in partnerships with governmental (e.g., USAID, US Department of State, etc.) and non-governmental organizations (e.g., Gates Foundation, ICRS, etc.) alike.

Of the three land grant missions, engagement is least represented in undergraduate curricula outside of, perhaps, formal agricultural education and/or extension academic departments or majors (Grotta and McGrath, 2013; Loizza and Lilliard, 2015). Undergraduate students are likely even less exposed to university international engagement programs as those programs are often outside of academic departments. Here, we report on our efforts to introduce US undergraduate students to international agricultural engagement through a service learning-based course taking place in rural Romania. The course used an experiential-learning approach where students utilized classroom and laboratory learned skills to: 1) identify specific quality issues in milk produced by smallholder Romanian dairy farmers; and 2) develop interventions farmers could employ to mitigate the identified quality issues.

Theoretical Framework

Higher education programs throughout the US often make great efforts to integrate "Experiential Learning" throughout their curricula. The use of experiential learning platforms in agricultural education, however, long predates its current attention. Agricultural education has always lent itself well to providing authentic learning experiences both inside and outside of the classroom. There are still many courses in US higher education agriculture curricula that are essentially skills-based (e.g., welding), where experiential learning platforms on some level are required for student learning.

Only in the past two decades, however, have educators truly examined experiential learning theory in an agricultural education context. Among the first to do so was Roberts (2006), who building on Kolb's theory of experiential learning, added that the continuous cycle of learning described by Kolb (1984) and others is impacted by the context in which the learning takes place. Thus, our course was grounded in a framework that employed an experiential learning platform but provided an authentic environment (Knobloch, 2003) where learning could take place in context. Additionally, while the course took place primarily in Romania, we aimed was to create a learning environment that increased the likelihood that the students' new learning could extend beyond the present and be applicable to new scenarios.

Course Overview

In our course, US undergraduate students partnered with Romanian undergraduate students to develop engagement programs aimed at smallholder Romanian dairy farmers. Prior to traveling to Romania, US students completed a one-semester course at the US campus focused on Romanian agriculture, engagement methodologies, and dairy quality analysis. In the first iteration of the course previously reported (Sajdera and Ebner, 2018), student teams conducted a quality assessment of milk produced by a group of dairy farmers in a small Romanian village who were interested in developing a milk collection program (Sajdera and Ebner, 2018). Students in this course identified high bacterial counts, both total bacteria and coliforms, as the major impediments to milk quality and barriers to developing a milk collection program. In this second iteration of the course described here, students worked with Romanian dairy farmers to: 1) develop and test cleaning and disinfection protocols that could be adopted by smallholder dairy farmers to mitigate high bacterial contamination rates in their milk; and 2) extend their findings to the dairy farmers through student-developed education programs. Throughout the course, student learning was assessed from both instructor (exams/quizzes) and student perspectives (questionnaires), while the students were also charged with measuring the effectiveness of the education programs they developed for the dairy farmers. Our results indicated that providing an experiential learning platform where students used knowledge and skills they learned in the classroom in an authentic context increased students' confidence to apply these skills to new scenarios. In addition to improved technical skills and knowledge, students also reported that the problem-solving based approach allowed them to utilize and reflect upon their behavioral skills (e.g., leadership, problem-solving, and critical thinking, among others). Here we present our results of the course in the hope that others can use our successes (and shortcomings) to improve their own similar courses.

Materials and Methods

Background and Partners

This study was reviewed and deemed exempt by the Purdue University Institutional Review Board. This course was conducted through a partnership between Purdue University (West Lafayette, IN, USA), Universitatea de Ştiinţe Agricole şi Medicină Veterinară a Banatului (USABTM; Banat University of Agricultural Sciences and Veterinary Medicine; USABTM), and the Asociaţia Judeţeană a Crescătorilor De Păsări şi Animale Hunedoara (AJCPA; Hunedoara County [Romania] Livestock and Breeders Association). With its main campus in West Lafayette, Indiana, Purdue University is Indiana's sole land-grant university and has a total enrollment of approximately

43,000 students. USABTM is one of four public agriculture and veterinary universities in Romania. USABTM has a total enrollment of approximately 6,000 students and is comprised of six faculties (departments), including Faculties of Agriculture, Horticulture and Forestry, Management and Rural Tourism, Veterinary Medicine, Food Engineering, and Bioengineering of Animal Resources. The AJPCA is a non-governmental organization located in Deva, Romania, and works in an agricultural extension capacity to improve animal management and production methods in villages throughout Hunedoara County. The three groups (Purdue, USABTM, AJCPA) have partnerships dating back to 2008.

Participants

A total of ten undergraduate students from Purdue University and six undergraduates from USABTM participated in this course. Only data collected from US students are reported here. The US students were all female and ranged from second to fourth year in their undergraduate plans of study. Eight US students were from departments within the College of Agriculture, while the remaining US students were from Colleges of Education and Health and Human Sciences. During the in-country portion of the course, US students were joined by six students (five males and one female) from USABTM. Romanian students ranged in year of study (second to fourth) and represented Faculties of Agriculture, Horticulture, and Forestry and Veterinary Medicine. Purdue University and USABTM students worked as an integrated group on all facets of milk collection and assessment, data analysis, and workshop presentation and delivery.

Preparatory Course

Prior to the in-country portion of the course, all Purdue University students completed a one-credit preparatory course in the spring of 2017. During the preparatory course, students were introduced to dairy science and concepts and practices in agricultural extension and development programming such as assessing needs, designing interventions, and measuring the outcome of interventions. Additionally, US students were introduced to Romanian language and Romanian culture and agriculture. US students were also trained in milk quality assessment laboratory techniques with a focus on quantification of total bacteria, coliform bacteria, and *E. coli* in milk. Finally, students completed an assessment at the completion of the preparatory course to measure their learning regarding milk quality analysis.

In-country Milk Quality Activities

Following a two-day orientation at USABTM, all students (US and Romanian) traveled to the village in which all dairy-related activities took place. Upon arrival in the village, students completed a four-day homestay experience in

Table 1. Answers to pre-workshop questionnaire from Romanian dairy farmers participating in the undergraduate-led extension program.

Question	Answer
How many dairy cows do you currently have? (total)	13.2 cows
How many dairy cows do you currently have? (milking)	6.4 cows
On average, how much milk does each cow produce each day?	14.5 L
Do you make value-added products with your milk (cheese, yogurt, etc.)?	Yes (3), No (2)
Do you sell milk?	Yes (5)
If you have extra milk, what do you do with it?	All sold (3), To livestock (2)
Please rate your familiarity with proper sanitation practices for milk collection (1 = not familiar at all; 10 = highly familiar).	8.1
How important is sanitation in milk collection to local farmers (1 = not important at all; 10 = highly important)?	9.3
What do you think are the main negative effects of poor sanitation in milk collection?	Contamination with bacteria (3), disease (2), manure (1), dust (1); milk spoils (1)
How often do you wash the cow's udder before milking? (1 = never; 5 = every milking)	5
How often do you use teat dips after milking? (1 = never; 5 = every milking)	1
If you use a teat dip after milking, what do you use?	na
Do you use soap to clean milk equipment? If so, what is the name of it?	Yes (3; 2 could name product), No (2)
Do you use disinfectants to clean milk equipment? If so, what is the name of it?	Yes (3; 2 could name product), No (2)

coordination with the AJPCA, living in the homes of families in the village. The objective of the homestays was to allow students to complement their classroom learning of Romanian agriculture with a short immersion experience where they could observe first-hand various agriculture practices used in the village.

Following the homestay experience, Romanian and US students were split into five groups consisting of two US students and at least one Romanian student. Each student group was assigned to one of the five dairy farms working with the AJPCA and volunteering to participate in the program. Participating farms were selected based on the involvement with the AJPCA, their experience working with the previous year's class, and their willingness to learn about sanitation practices in milk production. During their first visit to their assigned farms, students administered a questionnaire to each farm to gather information the students felt would be relevant to the design of their intervention (Table 1).

Students also observed and took notes of milking practices used at each farm as an additional informal assessment. Students then collected raw milk samples (100 mL) in sterile collection bags from both morning and evening milkings. Milk samples were taken from the last receptacle that the milk would normally be stored in prior to boiling/consumption at the individual farms. A temporary laboratory was set-up in a spare room provided by a local bed and breakfast (pensión) and used to analyze milk samples. All milk samples were analyzed for total bacteria (CFU/mL), coliform bacteria (CFU/mL), and presence of *E. coli* (yes/no) as previously described (Sajdera and Ebner, 2018). Briefly, milk samples were serially diluted in sterile water and dilutions were plated on 3M Petrifilm Aerobic County Plates (The 3M Company; Maplewood, MN) and 3M Petrifilm E. coli/Coliform Count Plates (The 3M Company). All plates were incubated overnight at 37°C. Total bacteria and coliform bacteria were then enumerated in each milk sample (CFU/mL raw milk) and presence of *E. coli* in each sample was determined by identification of blue colonies with associated gas production on E. coli/Coliform Count Plates.

The students were then charged with developing a cleaning/sanitation intervention that could effectively reduce bacterial concentrations in raw milk utilizing only locally available and affordable resources. These protocols incorporated data from the previous year's course as well as farm-specific data collected by students and the students' own observations of milking practices at each farm. The following day, after collection of the evening milking samples, students at each farm implemented the cleaning/disinfection protocol they had designed. Each farm employed the same cleaning/disinfection protocol. Milk samples were again collected from each farm at morning and evening milkings. These samples were again analyzed for total bacteria (CFU/mL), coliform bacteria (CFU/mL), and presence of *E. coli* (yes/no) as described above. Bacterial concentrations in milk samples before and after the cleaning/disinfection intervention were compared to assess the efficacy of the intervention. Following analysis of their data, students were charged with developing a workshop in coordination with the AJPCA with the participating farmers to discuss results and implications of the project and provide recommendations to farmers regarding sanitation practices based on the results.

Assessments

At the first farm visit, students interviewed all participating farmers to assess the farmers' current understanding of cleaning and disinfection as it related to their milking operations. Participants were asked prepared questions orally in Romanian and students recorded their responses in writing. Questions for farmers were first prepared in English, translated to Romanian and then reviewed by Romanian students in the course as well as partner extension professionals to ensure they were culturally appropriate. Enumerators each received instructions on how to consistently ask questions. Following the student-delivered workshops described above, participants were again interviewed to measure their learning regarding cleaning and sanitation of their milking operations and to estimate the likelihood that participants would adopt cleaning and sanitation protocols introduced by the students at their operations. Questions for participants were prepared as previously mentioned and participants were individually asked questions orally in Romanian and students recorded their responses in writing.

At the completion of all the activities, the US students completed a final assessment aimed at measuring students' new learning, the likelihood the students would apply their new learning in the future, and how often they were able to use and/or improve their different behavioral competencies during the milk project. The assessment instrument used questions previously used in our courses (Constantinescu, Borlea, Russell, and Ebner, 2017; Sajdera and Ebner, 2018) and was revised over time to provide face-validation. Students were given a set of prepared questions and recorded their responses in writing. Questions were both quantitative (e.g., "How confident are you that you could use the results from the microbiology tests to give the farmer advice on how to improve their milk?" 1 = not confident at all; 10 = highly confident) and open-ended (e.g., "What would you change in a future, similar project to make a greater impact?"). In an effort to provide greater validation, students were asked to define different behavioral skills (e.g., leadership, critical thinking, etc.) in their own words prior to their assessing the frequency with which they used those skills. All open-ended responses were collectively coded to identify dominant themes and subthemes across student responses (Saldaña, 2009).

Results and Discussion

Student-led Milk Quality Activities

In the first iteration of the course taking place the previous year (Sajdera and Ebner, 2018), students completed a quality assessment of milk from Romanian smallholder dairy farmers interested in pursuing a milk collection program. This quality assessment showed that bacterial counts in the raw milk collected by the students were well-above established standards for both total

bacteria and coliform bacteria (>10^5 CFU/mL and >100 CFU/mL, respectively; Schmidt 2016; USPMO 2011; Oliver 2010). The students concluded that high bacterial counts in raw milk were the biggest barriers to the farmer group creating a milk collection program (Sajdera and Ebner, 2018). In the second iteration of the course reported here, students aimed to create a cleaning/sanitation intervention that farmers could implement to affordably and effectively clean and disinfect the milking environment.

Working with five dairy farms, students began by observing milking practices and administering pre-questionnaires for each farm (Table 1). While students had studied dairy quality assessment and practiced milk testing methods in the preparatory course, this first farm-visit exercise was designed to allow students to see first-hand how their learning could be applied in the context of small-scale Romanian dairy production. From pre-questionnaires, participating dairy farmers reported that they all washed udders prior to milking. Students observed, however, that these washings, when done, only employed water with no detergents and single cloths/rags and water sources were used across all milking cows. None of the farmers reported using teat dips or any method of post-milking disinfection (Table 1). Based on the students' observations of milking practices, an assessment of resources readily available to the farmers, and their own research, students developed simple cleaning/disinfection intervention for udders (removing organic matter with a mild soap, changing towels, stripping teats, etc.) and equipment (1mL bleach per 1L clean water) aimed at reducing bacterial concentrations in collected milk. Importantly, this protocol could be implemented at all participating farms.

Students then collected raw milk samples from each farm at both morning and evening milkings and measured total bacteria, coliform bacteria, and *E. coli* to establish pre-intervention baseline measurements of milk bacterial concentrations. Afterward, students performed the cleaning/sanitation protocol alongside the dairy farmers, emphasizing the process and highlighting essential steps such as proper dilutions and use of clean rags/towels for each cow. Milk samples were then collected from each farm by the students at both morning and evening milkings after the cleaning/sanitation intervention and compared pre-intervention and post-intervention bacterial concentrations in the collected milk.

Students shared individual results with each farm and compiled data to better determine the effect of their interventions across farms. Although not a research study, post-intervention bacterial concentrations in collected milk were between 90% and 100% (below detection limits) lower than bacterial concentrations in milk collected prior to the interventions. These data were then used to develop a workshop on sanitation of milking environments with participating dairy farmers. During the workshop, students reviewed the results of the previous class's milk quality assessment as a means of introducing the farmers to the purpose of effective sanitation protocols. Students then explained the purpose for each step (cleaning vs. disinfection), the compounds used in each step (e.g., detergent, disinfectant), and how those compounds function to remove debris and eliminate or inhibit remaining bacteria. The cleaning and disinfection protocols were reviewed with participants and students then shared the results of their pre- and post-tests.

Student Assessment of Intervention

Monitoring and evaluation is an integral component of international development programming and allows projects to not only measure whether desired outcomes are reached, but to learn and adapt as programs are delivered (USAID, 2018). To introduce students to these concepts, the students were charged with developing an instrument they felt could measure the impact of their outreach programming. Toward this end, the students conducted post-workshop interviews with dairy farmers participating in the program to gauge both the participants' learning on sanitation and disinfection and the likelihood of participants implementing the suggested intervention strategies in the future.

While only designed as a practice for the students, aggregated participant responses from post-workshop interviews are presented in Table 2. Following the workshops, 100% of participating farmers (n = 5) reported that sanitation in milk collection was highly important (10.0; 1 = not important at all; 10 = highly important). Similarly, farmers reported that they were highly likely to use information from the workshop in their dairy operations (9.4; 1 = not likely at all; 10 = highly likely). Specifically, participating dairy farmers indicated that they were highly likely to implement udder washing (9.4; 1 = not likely at all; 10 = highly likely) and disinfection (9.4; 1 = not likely at all; 10 = highly likely). Results showed that participating farmers were also highly likely to share this information with other people who work on their farms (9.6; 1 = not likely at all; 10 = highly likely). Having the actual petri-film from the different farms was highly beneficial as it allowed the students to visually demonstrate the impact of the sanitation protocols, providing farmers the opportunity to see coliforms or *E. coli* for themselves. An example is presented in Figure 1.

Assessment of Student Learning – Technical Skills

In the preparatory course, we stressed the need for those working in international development to have both cultural and technical competencies and the importance of sustainability. Additionally, we emphasized the need to accurately match project objectives with actual capabilities of the implementers. Nevertheless, in our experience, students participating in service-learning courses abroad generally have high expectations as to the impact they will have on the community. Thus, not surprisingly, while workshop participants' responses indicated the workshop was impactful, the students' own assessment of the project was more muted (7.9; 1 = no impact at all; 10 = significant impact; Table 3). When asked open-ended questions as to how they could increase impact on future projects, 50% of students expressed concern over whether the introduced sanitation practices would truly be adopted by the farmers. In response to the same question, however, 60% of students felt that impact could be increased if they were afforded more time to understand the farmers' practices and

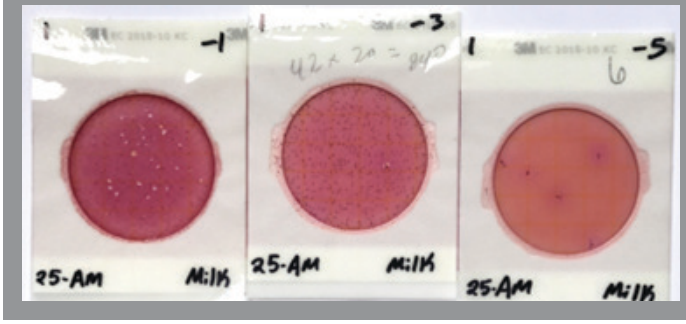
Table 2. Answers to post-workshop questionnaire from Romanian dairy farmers participating in the undergraduate-led extension program.

Question	Answer
After completing the workshop, how important is sanitation in milk collection (1 = not important at all; 10 = highly important)?	10
How helpful was the information from the workshop to your dairy operation (1 = not helpful at all; 10 = highly helpful)?	10
How likely are you to use information from the workshop in your dairy operation (1 = not likely at all; 10 = highly likely)?	9.4
What is the purpose of a detergent?	Clean (5)
What is the purpose of a disinfectant?	Kill bacteria (3), prevent disease (1), clean (1)
How likely are you to start washing udders with detergents? (1 = not likely at all; 10 = highly likely)	9.4
How likely are you to use a disinfectant as a teat dip? (1 = not likely at all; 10 = highly likely)	9.4
How likely are you to use detergent and disinfectant to clean milk equipment? (1 = not likely at all; 10 = highly likely)	10
How likely are you to share information from the workshop with other people who work on your farm? (1 = not likely at all; 10 = highly likely)	9.6

decision-making (data not shown).

Our aim was to provide an experiential learning environment that allowed students to learn technical skills through direct application in an authentic scenario (Knobloch, 2003). Like other experiential learning programs, we also aimed to structure the course where students had opportunities to both use and reflect on their behavioral competencies. As the course took place in Romania, we were especially interested in providing scenarios that allowed students to practice cultural competencies in determining how best to apply their new technical learning in an international context. Taken together, we aimed to create a learning environment that increased the likelihood that the students' new learning could extend beyond the classroom and be applied to new scenarios. Based on their own reporting and as evidenced in Table 3, students felt that their knowledge of milk quality increased substantially over the course of the project (before course: 2.9; after course: 8.6; 1 = not knowledgeable at all; 10 = highly knowledgeable). As an indication of how well their new learning could be applied in future settings, students reported that "if a farmer were to bring [them] a milk sample" they were highly confident (8.9; 1 = not confident at all; 10 = highly confident) that they "could conduct the microbiology tests necessary to determine its safety and quality." Likewise, students were highly confident (9.6; 1 = not confident at all; 10 = highly confident) that they "could use the results from the microbiology tests to give the farmer advice on how to improve their milk".

Figure 1. Examples of petri-film results shared with farmers showing growth of coliform bacteria indicating likely fecal contamination.



Assessment of Student Learning – Non-Technical Skills

A growing body of research has highlighted the limited capacity to accurately quantify improvements in students' behavioral competencies (e.g., critical thinking, etc.; Sullivan et al. 2018). We can, however, create learning scenarios that are more likely to facilitate students' both practicing these competencies and reflecting on how they used them, and students indicated that participating in the course provided frequent opportunities to practice communication, critical thinking, team-work, among other competencies (Table 4 and Table 5). Interestingly, however, students consistently ranked leadership as the skill least utilized in both the previous course (Sajdera and Ebner, 2018) and the course described here (Table 4 and Table 5). As instructors observing the students' participation, however, we were able to clearly identify leaders in different projects. This led us to postulate that students may have discordant definitions of leadership and prompted us to ask students to define different attributes or skills prior to answering questions as to how frequently they used these skills.

Several groups have examined students' definitions of leadership with conclusions similar to ours, in that students define leadership with a wide range of attributes. Not all attributes, however, are positive and Shertzer and Schuh

Table 3. Answers post-workshop assessment by undergraduate students following the completion of their milk extension program.

Question	Avg.	Std. Dev.
How helpful was the homestay experience in affording you a better understanding of Romanian culture/practices? (1 = not helpful at all; 10 = very helpful)	9.1	1.2
How helpful was the homestay experience in giving you insight into factors that influence Romanian farmers' decision making? (1 = not helpful at all; 10 = very helpful)	8.1	1.5
How often did the homestay experience give you opportunities to identify challenges (both personal or work-related) and develop and implement solutions to challenges? (1 = not at all; 10 = very often)	7.9	2.4
How knowledgeable are you about the relationship between microbial testing and the quality of milk? (1 = not knowledge at all; 10 = highly knowledgeable)	7.7	2.2
Please compare your level of knowledge of milk quality before the course and now.		
before	2.9	1.7
after	8.6	1.6
If a farmer were to bring you a milk sample, how confident are you that you could conduct the microbiology tests necessary to determine its safety and quality? (1 = not confident at all; 10 = highly confident)	8.9	1.4
How confident are you that you could use the results from the microbiology tests to give the farmer advice on how to improve their milk? (1 = not confident at all; 10 = highly confident)	9.6	0.7
How helpful was the milk project in giving you insight into factors that influence Romanian farmers' decision making? (1 = not at all; 10 = very often)	9.4	0.7
How much of an impact do you think your project had on the people with whom you worked? (1 = no impact at all; 10 = significant impact)	7.9	2.0
How helpful was the homestay experience in preparing you for the milk project? (1 = not at all; 10 = very often)	6.8	2.3
During the milk project, how often were you required to adapt to cultural differences? (1 = not at all; 10 = very often)	9.2	1.0
How well do you think you adapted to cultural differences during the milk project? (1 = not at all; 10 = very often)	9.0	1.1

(2004) wrote how such definitions may, in fact, constrain or otherwise limit students' potential to accept leadership roles. As in the previous course, students ranked "leadership skills" as the skill they used the least during the experience. When asked to define leadership, however, 70% of the students included definitions that could be described as authoritarian or singular ("someone who takes charge", "someone who gives directions", "someone who gets their way/things done", etc.; Table 5). Thus, more than half of the students defined leadership in terms that would not necessarily be complementary, which may explain why when asked to identify by name the students they felt assumed leadership positions (including themselves if appropriate), only 60% of respondents actually provided names. In the end, it may be as noted by James MacGregor Burns, "Leadership is one of the most observed and least understood phenomena on earth" (Burns, 1978; Shertzer and Schuh, 2004). As such, interpretations of students' perceptions of their own leadership experiences, including those in this paper, should be viewed with skepticism. Incidentally, faculty may have similar difficulties in developing collective definitions (Eddy and VanDerLinden, 2006). While perhaps not as extreme, students also had disparate definitions of other non-technical skills, notably in their definitions of "critical thinking", highlighting the difficulty in measuring learning objectives that include increased use and improvement of behavioral competencies. Complete results of student definitions of behavioral competencies and the frequency with which they used those competencies are presented in Tables 4 and 5.

Table 4. Student's ranking of frequency of with which they were able to use the following skills during the course (1 = skill used most often; 6 = skill used least often).

Skill	Ranking (avg.)	Std. dev.
Communication	2.2	1.5
Team building	2.6	1.3
Adaptability	2.7	2.2
Problem-solving	2.9	1.5
Critical thinking	3.0	1.8
Leadership	3.4	1.3

Table 5. Student definitions and frequency of use of various behavioral competencies following completion of the milk quality project.	
Q: How do you personally define leadership	
Dominant Theme	% of Students Self-reporting
Guide/mentor/facilitator	80
Authoritative	70
Adaptability/flexibility/inclusive	50
Results-driven	20
Example	20
How often did you practice leadership skills during the milk project? (1 = not at all; 10 = very often)	7.9 (avg.); 0.9 (std. dev.)
Q. What are some attributes of a good communicator?	
Dominant Theme	% of Students Self-reporting
Clarity/clear messaging	80
Approachable/understandable across groups	30
Listener	30
How often were you able to practice communication skills during the milk project? (1 = not at all; 10 = very often)	9.0 (avg.); 1.1 (std. dev.)
Q. What skills do you think are necessary for effective problem solving?	
Dominant Theme	% of Students Self-reporting
Communication skills	40
Listening skills	40
Critical thinking	40
Open mindedness/creativity/adaptability	30
Patient	20
How often did you practice problem solving skills during the milk project? (1 = not at all; 10 = very often)	8.6 (avg.); 1.1 (std. dev.)
Q. How do you define "critical thinking"?	
Dominant Theme	% of Students Self-reporting
Researching/assessing all angles/solutions	50
Problem solving	40
Thinking "outside the box"	40
How often did you use critical thinking skills during the milk project? (1 = not at all; 10 = very often)	8.1 (avg.); 0.9 (std. dev.)

Table 5. Student definitions and frequency of use of various behavioral competencies following completion of the milk quality project. (con't)	
Q. What are characteristics of a good team member?	
Dominant Theme	% of Students Self-reporting
Works well with others/cooperative	60
Inclusive	40
Good communicator	30
Hard-working	30
Good attitude (e.g., positive, easy-going, patient)	30
How often did you display characteristics of a good team member during the milk project? (1 = not at all; 10 = very often)	8.2 (avg.); 3.0 (std. dev.)

Conclusions

US land-grant universities continue to expand their global footprint and impact through large-scale development projects. Thus, it may be necessary to better integrate undergraduates into these programs as a means of developing future graduates with the skills needed to successfully implement university-led international engagement projects. The project completed in the course described is clearly on a much smaller scale than many of the partnerships between US land-grant universities and governmental or non-governmental funding agencies (e.g., USAID, World Bank) that are now common. However, this course was able to expose students to a component of land-grant universities that is rarely emphasized in undergraduate education and introduced them to the frameworks needed to work in development-related projects from a global perspective. Students were able to practice different aspects of development such as needs assessment, intervention design, and post-intervention evaluation that are integral to international development but extend to many areas of education. In future endeavors, course leaders should be conscious to manage students' expectations by reminding them that the objective of the course is more about learning a process, rather than making a significant developmental impact, especially considering the short timeframe allotted for the project. The results reported here, however, are still formative in that students were queried immediately after completing the course. It will be of interest to follow-up with students in both this year's course and last year's course to truly determine whether learning through the course impacted career choices or early career successes.

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Integrating Extension Educators in Agricultural Study Abroad Programming

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Abstract

The Cooperative Extension System serves as the liaison between the public and the university. As our nation continues to diversify and globalize, it is critical that as liaisons, Extension Educators have the skills to communicate cross-culturally in their respective communities. Developing intercultural competence is imperative to successfully communicate and operate in evolving American communities shaped by diversity. The objective of this study was to describe the change in educator intercultural development during an embedded study abroad program to Vietnam. Five Extension Educators were selected to provide undergraduate students with mentorship throughout a semester-long course with international travel during week 10. Mentors were required to complete pre- and post-assessments, including the Intercultural Development Inventory, while also responding to reflective prompts during the program. As a group, the educators regressed on the intercultural continuum by 8.0 points and remained in the minimization stage. However, educators reported meeting goals, increased personal development, and a positive experience with the program. Future programming should focus on the undergraduate mentor-educator relationship and more deliberate intercultural guidance for educator participants.

Introduction

Extension Educators must be able to effectively communicate with the diverse populations that compose their clientele base. Effective cross-cultural communication requires intercultural competence. Intercultural competence is defined as the ability to deduce cultural meanings and communicate effectively with the understanding that complex identities make up the environment in which people interact (Chen and Starosta, 1996). These abilities are not innate and must be developed through intentional instructional methods and practice (Vande Berg et al., 2012; Lockett et al., 2014; Jackson, 2015). While intercultural competence is clearly needed when working at the international level, as domestic demographics continue diversifying, it becomes more urgent that local representatives possess those skills as well. Providing Extension professionals with international experiences through engagement in university affiliated study abroad is one potential method to encourage professional development (Lockett et al., 2014; Ludwig, 2002; Harder et al., 2010).

In a needs assessment of the State of Indiana, Selby et al. (2005) explored Extension interests and experiences in intercultural learning and barriers prohibiting Educator participation in international and intercultural opportunities. They reported that 78.5% of Educator international travel was for leisure and there was limited fusion of global aspects into Educator domestic programs. Primary barriers to educator involvement with international activities included limited previous experience and lack of prioritization of international activities by Cooperative Extensions Services (CES) administration. Daniel et al. (2014) created a Cross-Cultural Program for CES personnel to develop participant worldview perspectives and gain new *cultural knowledge* for Educators in Georgia. This small study (n=7) discovered several benefits of the program including enhanced cultural appreciation and gaining first-hand experience. Harder et al. (2010) also highlighted the professional and personal development opportunities presented with hands-

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on experiences for Florida Educators (n=191). Cultural competence training was developed and implemented to address the increasing need for Extension Educators to possess skills to sustain effective programming across the developing diverse clientele base and workspaces (Deen et al., 2014). This has become an essential skill development within Washington State University's Extension and is considered in performance reviews due to the necessity of sustainable outreach. International experiences can empower Extension Educators to make informed local decisions through a global lens (Treadwell et al., 2013).

Although information is available on Extension affiliates' experiences traveling internationally, limited research is focused on evaluating the impact of involving CES personnel directly in university study abroad programming. Such programs could provide benefits for both the undergraduate students as well as the Extension Educators (Karcher et al., 2013; Treadwell et al., 2013; Grima et al., 2014; Laverick, 2016). Involving Educators as mentors provides an opportunity to engage them directly in international programming (Karcher et al., 2013). This allows for modeling behaviors such as teamwork and effective leadership in participation with the students (Gyori, 2012). The concepts (e.g. agricultural practices or cross-cultural skill development), which the mentor focuses on while mentoring students, have a direct effect on the student learning experience (Gyori, 2012). Involvement in international programs, including mentorship of undergraduate students, has the opportunity to address the development of intercultural competence Educators should possess in their public roles.

In addition to Extension Educators' responsibility to the public, they are presented the opportunity through their Land Grant institutions to build relationships with student populations. Undergraduate student exposure to Extension is mutually beneficial for recruitment and retention (Arnold and Place, 2010). Not only should CES address this need for communicating cross-culturally with the public, but also the pool from which most future educators are recruited. Student relationships with Extension affiliates were cited by students as being the most influential in their pursuit of careers in CES and their ultimate decision to become an Extension Educator (Arnold and Place, 2010). Recruiting and retaining potential educators is a priority of Extension (Penrose, 2017). This allows for personal and professional growth in congruence with developing relationships alongside students who may one day fill their shoes

Based on the limited current available literature, this case study was designed to explore the benefits of Extension Educators serving as mentors to undergraduate students in a short-term study abroad program. Researchers hypothesize that 1) the role of mentorship will be positively perceived by both student and Educator participants and 2) participation in the program will increase the development of the Extension Educators intercultural competencies.

Methods

Educator Recruitment, Selection, and Responsibilities

All methods were approved by Purdue University's Institutional Review Board. In fall 2017, an application was made available to all Extension Educators in Indiana to participate in the program. From the applications, five educators were selected to participate and serve as mentors to the undergraduate students enrolled in the study abroad course, travel with the program to Vietnam, and to participate in activities related to intercultural development. The composition of the Educator cohort was one female and four males. All Educators had previous international experience, although time spent out of the United States varied from 4 to 8 weeks (n=3) to more than one year living in another country (n=1). All program participants had been in their role with Cooperative Extension Services for more than 15 years. The cohort of Educators represented five of Indiana's 92 counties, providing a wide variety of county demographics.

Educator Mentor Role and Program Responsibilities

Throughout the program, Extension Educators served not only as subject matter experts in their individual areas of expertise in agriculture but as agricultural discipline mentors to the undergraduate students. Eleven undergraduate students, representing majors from across the College of Agriculture, enrolled in the spring 2018 embedded-study abroad program. Students met weekly on-campus for 50 minutes throughout the 16-week semester and traveled to Vietnam for 9 days during Spring Break. At the start of the semester, students were divided into four teams (3, 3, 3, and 2 students) and 3 of the teams were assigned one educator. The team consisting of two students was assigned two educators. Educator expertise provided students with a critical resource in their focus on food security and environmental challenges within the course. Each team was tasked with identifying a challenge in the current Vietnamese agricultural system. Teams worked with their mentors to identify a topic and a research plan. The semester-long project concluded with a Vietnamese Celebration night where students and Educators shared an 8 to 10 minute video they prepared to address the research topic and discuss innovative solutions. Faculty, administrators, students, and family were invited to the dinner and presentations. Throughout this process, the Educators served to 1) provide input on student assignments via email or phone, 2) present one lecture to the students based on their area of expertise, and 3) participate with their assigned team of students on creating the videos for the semester-long research project.

In addition to the mentor role, Educators participated in self-reflective activities during the international experience. In-country, reflective journaling included daily responses to provided prompts. Examples of these include: What was something you learned about Vietnamese culture/agriculture that surprised you today; Why did this surprise you?; and how have cultural differences made you more aware of

Table 1. Themes Underlined in Educator Responses to Three Open-ended Questions.	
Questions	Themes
A. Did you achieve the goals you had for yourself in participation of this program? If so, how did you achieve your goals? If not, why not?	• Gain an understanding of the new culture. 3 of the 5 Educators included the word “understanding” while 1 used “learn about”. • 3 of the 5 Educators felt they achieved their goals.
B. How do you think your participation in this international and mentor experience may or may not impact your future teaching, research or Extension activities?	• Developing worldviews/seeing a new perspective.
IC. Has this program motivated you to globalize (i.e. incorporate intercultural/multicultural learning objectives) extension programs? If so, please explain how.	• Share with community – by writing or incorporating in programs. 3 of the 5 Educators shared their experience.

your own culture (limitations, strengths, or biases)?. While in Vietnam, educators visited local markets, interacted with students and faculty at an agricultural university, and engaged with local farmers. Additionally, program leaders led group discussions and intercultural activities throughout the program. The goal of the journaling and in-country experience was to assist in developing intercultural competence.

Program Assessment

A researcher-developed pre-questionnaire was created and administered to the educators during week 2 of the semester. The questionnaire included 4 open-ended questions designed to capture educators’ goals, international involvement, and plans to incorporate learning after participation. The survey was administered via Qualtrics and was open to response for one week (n=5, 100% response rate). The researcher-developed post-questionnaire was administered at week 15 of the semester via Qualtrics and included 6 open-ended and 12 Likert scale questions, designed to capture educators’ experience as a mentor, how they incorporated international components locally, overall experience in the program, and 3 demographic questions (n=5, 100% response rate). Questions about international involvement, perceptions of importance in infusing international concepts, and prompts for reflection were influenced by previous study abroad and international research (Selby et. al., 2005; Price and Savicki, 2011). Additionally, students on the program responded to a post-course questionnaire that included 8 open-ended questions designed to assess the value of the educator-student mentoring relationship.

The Intercultural Development Inventory (IDI) was administered both at weeks 1 and 15 of the semester. The IDI is a 50-item inventory which places individuals on a continuum of intercultural sensitivity (IDI, 2018). The numbers reported in perceived orientation (PO), developmental orientation (DO), and orientation gap (OG) correlate with a developmental stage on the Intercultural Development Continuum (IDC). There are several levels of intercultural sensitivities that fall along the IDC. These levels are separated into ethnorelative stages, “meaning that one's own culture is experienced in the context of other cultures,” and ethnocentric stages, “meaning that one's own culture is experienced as central to reality in some way” (Hammer et al., 2003). Denial and polarization fall within ethnocentric, minimization is seen as a transitionary stage, and acceptance and adaptation fall within ethnorelative (Hammer, 2012b).

Statistical Analysis

The DO, PO, and OG of the educators were compared using paired t-tests on sample means using SPSS Statistics Version 25 (IBM Corp). Statistical significance is reported at a $p < .05$.

Results

Mentoring Experience

Educator and student participants responded to two open-ended questions about the role of mentorship in the program. In response to the question, "In what ways did your mentor add value to your semester project?" students primarily indicated that mentors provided new perspectives and insights about course topics. Educators indicated learning from student perspectives and enjoyed working directly with them as benefits in response to "How did the mentor role benefit your international experience?." Both educators and students reported that the relationship provided new perspectives from which to view the course concepts.

One student stated that “they were able to teach us about things that we do differently inside the United States” while another said, “they did a great job giving us insight we didn’t even think about.” Educators (n=4) specifically noted that they enjoyed learning and/or working with the student participants. One Educator reported, “I got to see the experience not only through my own eyes but through the eyes of a younger generation.” Another Educator mentioned they wished they could spend more time together, but during the time they did spend with their assigned students “it was valuable to hear their perspectives and the knowledge they brought to the table.” A conclusion provided by an Educator was that “each time we have an opportunity to mentor or teach, we get better at what we do.” Four of the five Educators indicated that they strongly agreed or agreed that being a mentor to undergraduate students was an important part of the Vietnamese program experience. The majority of Educators perceived mentorship as an enhancement to

participation in the program.

Professional Benefits

The group of educators responded to three open-ended questions about their participation following the semester program. Themes emerged in responses to all three questions (Table 1). Educators believed they met goals of understanding more about the culture in which they were immersed. They also reported that they developed new worldviews due to their experience in the program. Lastly, they have put into action sharing their experiences with their local communities.

Educators reported being motivated to share what was learned throughout the program. Three of the five participants have already written about, presented orally on, and/or incorporated study abroad program concepts into their domestic CES programming. One educator wrote "my goals were to increase my understanding of other cultures, how they relate to Indiana agriculture and reflect to the citizens of our community how global agriculture comes home. I have successfully done that." Another indicated the value of the program in connecting beyond the local communities saying that "I have written articles in local papers about the trip and they have been well received. The program demonstrates that Extension is connected to a bigger world." All Educators strongly agreed or agreed with the statement, Comparing agriculture systems across cultures enhanced my job as an educator and perceived mentorship as important for personal and professional development.

The program also prompted the Educators to reflect on what was learned throughout their interactions in Vietnam. One Educator reflected, "I need to loosen my attitude of expecting everyone to look at the world the way I do" and suggested that pushing their viewpoint onto their clients is not an effective method for creating change. This indicates how interactions abroad challenged their perspectives on their local role in CES. Another example of development was the reflection that "the most important part of the trip was the fact that I was a bit uncomfortable at times. The trip was very good for me to push my boundaries and make me deal with situations." Increased flexibility can be a skill gained from facing challenges abroad.

Table 2. Individual Extension Educator pre- and post-reported perceived orientation (PO), developmental orientation (DO), and orientation gap (OG) before and after completing a study abroad program to Vietnam.

	Pre-PO	Post-PO	Pre-DO	Post-DO	Pre-OG	Post-OG
Educator 1	133.8	128.0	121.9	109.0	11.9	19.0
Educator 2	121.7	115.8	94.5	72.6	27.3	43.2
Educator 3	124.8	123.6	104.8	99.8	19.9	23.7
Educator 4	125.0	124.8	105.0	102.9	20.0	21.9
Educator 5	121.8	125.3	103.1	104.0	18.7	20.3

Intercultural Development

Table 2 represents individual Educator results of pre and post PO, DO, and OG. Before the program, 4 out of 5 educators were in the DO stage of minimization while one was on the low end of acceptance. After the program, 1 of the 4 in minimization moved to polarization and the educator in acceptance shifted down to minimization. In polarization, individuals operate from a mindset of "us versus them" when faced with cultural differences (IDI, 2018).

The pre-PO for the group was 125.4 and the post was 123.5 (Figure 1A). There was no statistically significant difference between the group Pre-and-Post PO. As a group, the educators placed themselves in acceptance both before and after participation in the program according to their subjective view. This indicates that the group believes it operated in an ethnorelative stage that respects cultural difference as it is unique to individual identity and are in a state of curiosity (Bennett, 2014).

At the start of the program, the group began with a DO of 105.86 and ended with a DO of 97.87 (Figure 1B). These changes were not statistically significant, however, any change of more than 7 points is considered meaningful to IDI (2018). The subjective view of the group was in acceptance. However, the group's operational stage (DO) was in minimization. Groups in minimization tend to obscure differences, minimizing their importance, and use their own cultural perspective to apply in cultural contexts worldwide (Bennett, 2014).

Figure 1A. Pre and Post Perceived Orientations for the group of 5 Extension Educators participating in an undergraduate study abroad program to Vietnam.

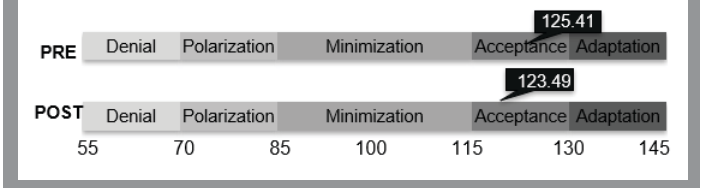
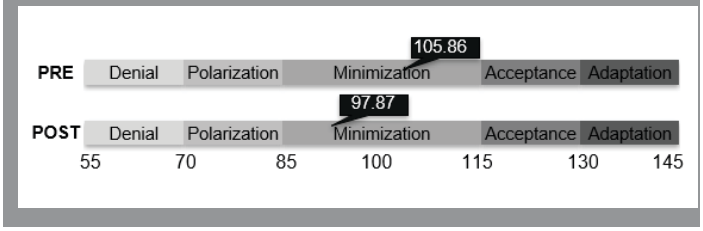


Figure 1B. Pre and Post Developmental Orientation for the group of 5 Extension Educators participating in an undergraduate study abroad program to Vietnam.



A PO seven points or above the DO (i.e. if the OG is more than seven points) signifies an overestimation of intercultural competence and is considered a meaningful difference according to the IDI (Hammer, 2012a). The OG changed from 19.55 to 25.62 from the beginning of the semester to the end. These results display an increase in the overestimation of intercultural competence, however, there was no statistically significant difference from pre-to

post-IDI.

The group of educators moved from 20% unresolved to 40% unresolved according to the pre- and post-IDI results. Unresolved indicates a sense of disengagement or a feeling of disconnection with their primary cultural group (IDI, 2018). After completion of the program, there was a 20% increase within the group of feeling detachment of membership in their community (Hammer, 2012a).

Discussion

Mentoring can foster developmental changes in skills that may be applied both academically and socially (Karcher et al., 2002; Grima et al., 2014). Educators participating in the Vietnam course reported the student-mentor relationship as important to their overall experience. A nurturing learning environment provides support to students to strengthen their ability to develop identity and mastery of skills (Crisp, 2017). Students and educators on the Vietnam program emphasized "insights" and "perspectives" by working together as a team. Relationship building is a key component of successful mentoring (Byington, 2010). Henley et al. (2018) reported valuable aspects of Extension Educators mentoring of undergraduates, including gaining an understanding of career opportunities in CES, developing a feeling of ownership in their projects, and expanding career potential. Such opportunities may increase the number of undergraduates interested in pursuing a career in extension and build relationships across the teaching and extension missions of Land Grant institutions (Seevers and Dormody, 2010; Stevens et al., 2014). The responses provided by participants, such as "getting to see and learn from student perspectives" in addition to discussing their "experience and feelings during the trip" and an explicit statement that "it was very enriching for me", provided evidence that the Educators valued the mentoring experience.

Additionally, there were meaningful professional benefits from Educators participation in this program. Mentoring relationships are advantageous in the workplace, including Extension, to develop skills, enhance performance, and personal growth (Kutilek and Earnest, 2001). CES uses mentoring to develop employees in areas such as effective leadership, increased organizational commitment, and satisfaction in their roles (Denny, 2016). In response to open-ended questions, educators reported meeting goals, increased personal development, and a positive experience in the program (Table 1). Their responses supported the belief that they met the goals they set for themselves. The experience broadened perspectives. For example, one educator said "a broad perspective is important" and another said, "having more of a worldly view enhances my ability to be an Educator." This aligns with results from previous studies that agents broadened their knowledge and perspectives of global agriculture through international experiences (Stevens et al., 2014). Three of the five educators on the Vietnam program reported using the program experience to influence their CES outreach. Those who have not yet incorporated the experience referred to a lack of resources such as time. As reported, many Educator participants have already written articles or columns, while another discusses having "already incorporated some of what I learned in our educational programs." This indicates that involvement in university study abroad programs has the potential to globalize local programs, supported by Treadwell et al. (2013) findings in participation with international programming.

In addition to the benefits of the program on personal and professional growth, a second objective was to determine if Educator intercultural development was altered by program participation. As a group, there was no progression on the IDC through participation in the program as shown by the IDI results of the study. However, there are several possible explanations. Foremost, the undergraduate course was designed with student intercultural development in mind, thus influencing the activities required for the entire class, not just the Educators. While including intercultural learning methods, the appropriate degree and type of support provided are critical for intercultural development (Paige and Vande Berg, 2012; Engle and Engle 2012). While using intercultural learning methods, a lack of intercultural development is evident because participants have not received the support needed or been engaged with effective developmental methods (Terzuolo, 2018). Developmental orientation influences which activities will help progress participants along the continuum. While the majority of Educators were in minimization at the start of the program, the class predominately completed activities that supported individuals in denial and polarization.

Stuart (2012) indicates the criticality of considering stage development when designing interventions. The ability to anticipate and influence outcomes depends on the student's developmental stage, the environment in which they are placed, and the intervention administered; without these components, student development is, at best, uncertain (Stuart, 2012). Individuals in each stage on the developmental continuum have varying responses to cultural differences and experiences that require different support (Hammer, 2012b; Vande Berg et al., 2012; Bennett, 2014). The course assignments were selected to develop student cultural self-awareness and awareness of others. These are skills that were already developed in the educator group as indicated by the group stage of minimization on the IDC.

As a group, there was an average decrease of 8 points on the IDC. Regression on the continuum can occur as a result of overwhelming cultural differences (Jones et. al., 2016). This may have occurred as educators traveled to a developing country vastly different from the United States. The educators in this study increased in cultural disengagement (20% to 40%), indicating they experienced disengagement with personal cultural identity. Cultural disengagement can also be defined as not partaking in cultural activities (Gayo, 2017). Feeling disengaged with one's own cultural identity and being overwhelmed with cultural differences may have impacted the group results due to lack of participation or commitment to the intercultural learning activities included in the program. There are a multitude of factors that dictate cultural disengagement such as socioeconomic status, gender, age, and geographic location, which should be further explored in educator

intercultural development (Gayo, 2017).

It is critical to understand the multiple dimensions of cultural difference the educator group encountered throughout the program. Not only were they immersed in Asian culture while visiting Vietnam, but educators were also encountering generational differences. They were required to work with students, all identified in the millennial generation, on a group project as a mentor, travel with them in a different country, and serve as a university role model as affiliated with CES. These situations may have created additional challenges for educators. When an individual is placed in an environment that challenges their personal beliefs or history, it can cause overwhelming feelings and cognitive dissonance (Mitchell and Paras, 2018). It can display itself as feeling uncomfortable and present as regression on the IDC (Lambert Snodgrass et al., 2018). The study abroad destination of Vietnam is another important nuance between educators and students. Students and educators have a different relationship with Vietnam. Students learned about the Vietnam War in history classes while multiple educators were alive during this time and knew someone involved in the war. The intersection of ethnic and generational cultures begins to unravel complicated influences that may be contributors to the group IDI results.

Additionally, all educators completed the IDI, but were not required to go through a debriefing with a certified administrator. Educators were not required to complete an IDI debrief due to their various locations around the state and proximity to a qualified administrator to review individual results. Cultural mentoring is critical and plays a positive role in intercultural competence gains (Hammer, 2012b, Paige and Vande Berg, 2012). The lack of individual cultural mentoring provided to the educators may have influenced the outcome of the group IDI results. Educators participated in the course through intermittent reflections and by providing discipline-based guidance for the students. More deliberate activities, focused toward the educator stage of minimization, may have provided the support needed to progress on the IDC (Stuart, 2012).

Future studies should engage educators in more cultural activities and reflection. Paige and Vande Berg (2012) identify a lack of intentional reflection specifically on the cultural immersion and experience as a contributor to a lack of intercultural development. Increasing mentor interaction with students could prove beneficial for both groups, by increasing exposure to CES, providing different perspectives regarding discipline content and intercultural learning, and giving Extension Educators the opportunity to use experience for globalizing local programs. Educators should be required to complete the IDI debrief with a qualified administrator in order to process their results and develop an Intercultural Development Plan. Limitations included a small sample size, limited face to face interactions with the Educators before and after study abroad, self-selection of participants, and restricted authority over Educator participation in activities. Through the use of intercultural learning methods with emphasis on experiential ideals such as critical reflection, and activities aimed to give support in the development of intercultural competence at multiple levels, this course design can be modified for use in other study abroad programs involving Extension Educators.

Conclusion

In conclusion, there were several meaningful benefits provided to both students and Educators from the participation of Extension Educators as mentors. Student and educator responses support a positive attitude towards the mentor-student relationship. As indicated, rewards encompassed both personal and professional development. Educators reported meeting their personal goals and applying what they learned during the study abroad program in their local Extension programs. In regards to the intercultural competence development component, there were no statistically significant changes in group PO, DO, or OG. However, the survey responses provided useful insight on how to enhance future programs and engage Educators more meaningfully in the intercultural learning process. By addressing the challenges these participants encountered in the program, this model can be adapted and honed for amplified benefits. Future Extension Educators have the potential to engage students in agricultural concepts using their expertise, provide insight to students about CES local and international programming, and develop intercultural competence through mentorship in undergraduate study abroad programs.

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Self-perceived Employability Skills from Agricultural Study Abroad Experiences

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Abstract

Most college students and employers have differing views about skills gained from participating in a study abroad program. If created with purposeful intent to emphasize employability skills, study abroad programs can increase soft skills desired by future employers. Selected participants at Texas A&M University recorded their perceptions about soft skills gained from several agriculture-based, short-term, faculty-led study abroad programs. Many students perceived gains in important employability skills (i.e., communications, global awareness, flexibility, adaptability, and intercultural skills). Study abroad programs should be developed and administered to emphasize future employment soft skills to help participants more easily transfer such skills to future workplace settings. College of agriculture educators can help students develop soft skills through agriculture-focused, short-term, study abroad programs. Future research should explore agricultural employers' beliefs about students' employability skills gained from study abroad. A need exists to know which soft skills are most beneficial for entry-level employment, as identified and prioritized by agricultural industry employers, and/or community organization leaders.

Introduction

Anecdotally, it is believed (Loveland, 2017) that study abroad programs equip students with valuable employability skills such as interpersonal and communication skills, teamwork, problem-solving, and analytical skills (Potts, 2015). Educators and administrators encourage university students to participate in study abroad, one of several high impact experiences (HIEs) now common in many undergraduate degree programs (e.g., first-year seminars and experience, learning communities, writing-intensive courses, undergraduate research, diversity/global learning, service learning, community-based learning, internships, and capstone courses and projects). High impact experiences, such as study abroad, help students develop deep, long-lasting life skills (e.g., personal and social responsibilities, global awareness, adaptability, and intercultural awareness) that are difficult to achieve in traditional classroom settings (Kuh, 2008). Students engaging in HIEs develop a more diverse resume with international experience (Harder et al., 2015).

Higher education institutions face the challenge of providing relevant educational opportunities that might have some social benefit. Evolving social change requires universities develop globally educated students (Zhai and Scheer, 2010). Educators promote study abroad because they believe such programs equip students with desirable social skills, enabling them to make meaningful contributions to a global society. Students heed this advice because participation in study abroad programs has increased. The Association of International Educators (NAFSA) reported that study abroad participation grew about 23% (i.e., ~250,000 to ~325,000) from 2006-2016 (Trends in U.S.

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Study Abroad, 2016). A potential cause for this growth may be that university officials influenced students to study abroad, based on intangible employability skills.

Study abroad helps students build soft skills that increase their competitiveness in the global marketplace (Gibson et al., 2015). Soft skill development is important for one's employability. Soft skills are defined as people skills, or personal attributes such as intercultural skills, communication skills, self-awareness, and professionalism (Robles, 2012). A reduction of study abroad programs could hinder students' soft skill development (Harder et al. 2015). Career skills developed from study abroad are desirable to employers (Briers et al., 2010; Kronholz and Osborn, 2016), especially when combined with academic performance (Harder et al., 2015).

College of agriculture students seeking global experiences choose short-term, faculty-led study abroad programs because of low cost, safety, and minimized loss of job earnings while abroad (Briers et al., 2010; Chang et al., 2013). Short-term study abroad is recommended highly because university officials believe it helps develop future leaders for a global market (Bobbitt and Akers, 2013). Minimal information is known about students' self-perceived employability skills after participating in an agriculture-based study abroad program (Bobbitt and Akers, 2013; Briers et al., 2010; Chang et al., 2013). Kronholz and Osborn (2016) stated a majority of research related to study abroad experiences focused on students' psychosocial and personal development. Do students perceive beneficial employability skills are gained from participating in short-term study abroad programs?

Intercultural skills may be defined as intercultural competence (Barker and Mak, 2013). A working definition of intercultural competence is one's attitude, knowledge, behavior, and skills displayed during intercultural interactions (Barrett, 2012). Attitude includes respect, openness, and curiosity toward other cultures. Knowledge is viewed as cultural self-awareness and general understanding of another culture. Behavior is viewed as having appropriate actions while maintaining flexibility to changing conditions. Skills include one's ability to interact with others and adapt to other cultures. Barrett (2012) believed these four components constitute the core aspects of intercultural competence.

Study abroad programs enhance the development of intercultural skills (Farrugia and Sanger, 2017). Study abroad students engage in cross-cultural interactions. Real-life, cross-cultural contact is a preferred method of intercultural skills development (Messelink et al., 2015). Perry and Southwell (2011) determined that cultural immersion was a necessary component for developing intercultural competence. Cultural immersion can consist of intercultural experiences such as engaging with host country locals or through language development. Non-judgmental behavior toward others in another culture, being open-minded and flexible when scheduled events do not occur as planned, are a few examples of positive intercultural skills development that can be derived from participation in a study abroad program (Bennett, 2011).

Communication skills are "The ability to convey ideas to others through verbal and written means, using clear and effective language that accounts for the audience" (Farrugia and Sanger, 2017, p. 7). Another widely accepted definition is the ability to interact with others (Hull, 2012). Communication skills consist of multiple elements; four described in the literature (Bonaccio et al., 2016; Farrugia and Sanger, 2017; Hull, 2012) were interpersonal, verbal, nonverbal, and written communication skills.

Interpersonal communication takes place during interactions with two or more people. Interactions can include nonverbal and verbal behaviors, and other actions associated with unpredictability or answering questions (Hull, 2012). Hull noted that interpersonal communication skills are learned most commonly through observation of parents or peers (2012). Because interpersonal skills develop over time through observation and imitation, they are rarely taught in formal education situations.

Verbal communication is described as the message being communicated, while nonverbal communication relates to the delivery method (Bonaccio et al., 2016). Bonaccio et al. stated that nonverbal communication skills enhance the communicator's message (2016). Understanding nonverbal communication, such as eye contact and facial expressions (Bonaccio et al., 2016), are especially important for interpersonal and intercultural interactions. The ability to navigate intercultural interactions is an important skill for living and working in a diverse society, therefore developing verbal and nonverbal skills is viewed as a critical component of professional success (Dolan, 2017).

Written communication, the ability to communicate in written form (Dolan, 2017), is the ability to adapt one's writing to various situations (Moore and Morton, 2017). Communication skills are a core objective of Texas' Core Curriculum, which defines it as a student's ability to develop and express ideas through oral, written, and visual means. Texas A&M University's Core Curriculum requires all students complete two courses in their major that fulfill a writing and communication (W/C) graduation requirement. W/C courses develop students' communication skills. Written communications are essential when seeking employment because it often is the first communication seen by potential employers through cover letters or resumes (Dolan, 2017).

In employability terms, to articulate ideas verbally or through writing (Farrugia and Sanger, 2017) is a highly valued communications' attribute. An estimated 75% of employers value universities' emphasis on developing written and oral communication skills (Stephenson et al., 2015). In addition to W/C course requirements, Texas A&M University officials initiated a requirement of completing HIEs to some undergraduate degrees. Studies (Farrugia and Sanger, 2017; Williams, 2005) show that study abroad provides interpersonal, verbal, nonverbal, and written communication skills. However, the degree to which skill development benefits those in a study abroad varies upon program characteristics, destination of study, and students' abilities to explain the benefits to future employers (Briers et al., 2010; Chang et al., 2013; Farrugia and Sanger, 2017).

Self-awareness skills are the ability to actively process and identify information about oneself (Morin, 2011).

Exhibiting self-awareness can be described as reflecting upon experiences that coincide with processing and identifying information. Self-awareness is an important element of emotional intelligence because it directly influences communication with others (Caldwell, 2009). A common trait displayed by individuals with heightened self-awareness is self-regulation, which is one's ability to alter behavior, resist temptation, and control moods or emotions (Morin, 2011) to better relate with others (Caldwell, 2009). Controlling one's reactions is an important aspect of self-awareness, which is especially valuable in diverse settings (Urdang, 2010).

The literature in social work and medical professions is replete (Benbassat and Baumal, 2005; Cushman et al., 2015; Jani et al., 2016) with the importance of self-awareness relative to diversity. Likewise, agricultural and extension education studies show diversity as an important competency for extension agents (Ghimire et al., 2017), as job-related competencies in international development (Kock and Weeks, 2015), and as a critical study abroad component for student engagement with other cultures (Black et al., 2013).

Self-awareness skills are referenced in leadership contexts. Ashley and Reiter-Palmon (2012) mentioned self-awareness is an attribute of successful leaders. Authentic leadership involves being aware of one's limitations (Ford and Harding, 2011). Self-awareness and self-regulation are recognized also as core components of authentic leadership (Gardner et al., 2005). A contributing factor for the development of authentic leadership is the process of reflection. Self-reflection often enhances one's self-awareness by providing clarity on core values and goals.

Professionalism, as defined by Kinsinger (2015), is "service through the use of specialized knowledge, skills, and experience; holding oneself to the highest standards of thought, word, and deed" (p. 35). Professionalism can be viewed as a set of skills or a state of mind (Collier, 2012). Collier noted that interpersonal skills are often associated with professionalism because of one's outward appearance and ability to interact with others (2012). Compassion, integrity, and respect were three important attitudes used to define professionalism (Collier, 2012). Robles (2012) identified professionalism as one of the top 10 most important soft skills valued by business executives.

Intercultural competencies, communication skills, self-awareness, and professionalism are important employment-related skills that can be gained from study abroad participation. Are these skills also gained from agriculture-based, short-term, faculty-led study abroad programs? If so, how would students articulate these skills to future employers?

Purpose and Objectives

The purpose of this study was to discover students' self-perceived employability skills gained from participating in international HIEs such as study abroad. Two research objectives guided data collection. Those objectives were to 1) Describe students' perspectives of personal and social responsibilities gained from participating in HIEs, and 2) Explain which self-perceived skill gains may be useful when seeking employment.

Methods

A qualitative research design (Patton, 2002) for this non-experimental study afforded appropriate analyses techniques (i.e., content analysis procedures) to examine former HIE participants' archival data from agriculture study abroad programs in the College of Agriculture and Life Sciences (COALS) at Texas A&M University. The phenomenon under study was identified by the researchers as employability skills derived from study abroad. Identifying a phenomenon is the first step in a qualitative study (Fraenkel et al., 2019). A qualitative research design was appropriate because the research topic included recording participants' qualitative responses (Bogdan and Biklen, 1998). This research was approved by the Institutional Review Board at Texas A&M University.

The population of interest was based on COALS' fall 2017 enrollment (N = 7,792). Of this population, ~57% were females (n = 4,407); males totaled 3,385 (~43%). Nine categories described the population's ethnicities (American Indian, Asian, Black, Hispanic, International, Multi-racial excluding black, Native Hawaiian, Unknown/Not Reported, and White). The largest ethnic group was White, totaling ~67% (n = 5,180). The second most represented was Hispanic, which was ~18% (n = 1,418) students.

A purposive sample (n = 105) was used to represent the target population because COALS' HIEs provided the same and equal chance of participation to all students (Fraenkel et al., 2019); we remind all that HIEs are not confined solely to study abroad, but include domestic research scholarship and other forms of high impact experience. Participants self-selected into the sample, based on participation in one or more study abroad programs (Costa Rica, Greece, Namibia, and/or Poland) from summer 2017 through summer 2018.

The researcher-developed instrument was derived from Texas A&M University's Core Curriculum components (i.e., personal and social responsibilities) (Texas A&M University, 2017) and COALS' professional development program for intercultural sensitivity, cultural discourse, and leadership. Three open-ended questions related to self-perceived personal and social responsibilities (i.e., to live and work in a diverse society), communicating the benefits of a HIE to others (i.e., in terms of gaining broader global perspectives toward other cultures), and informing a future employer about such benefits (e.g., to the company or to society). The qualitative research questions were deemed valid by a panel of experts from the Texas A&M University's international study abroad programs office, COALS' administrators, and HIE professors.

Data were collected online with Texas A&M University's Qualtrics software. Online surveys are a mainstream method for collecting data (Chang and Vowles, 2013). Students who participated in agriculture-based study abroad programs (i.e., HIEs) at Texas A&M University from summer 2017 to summer 2018 were prompted in post-travel settings to think about the HIE. Participants were not required to respond

immediately but rather were asked to "think about the HIE effect personally or when considering future employment," before accessing the open-ended online survey. To encourage learners' reflection processes, five prompts were provided, three of which pertained to this study (note: two prompts related to global awareness and attitudes, which are not reported herein):

1. Consider your personal and social responsibilities (i.e., take informed and responsible action to address ethical, social, and environmental challenges in global systems and evaluates the local and broader consequences of individual and collective interventions), and thinking about culture, diversity, pluralism, etc., finish the following sentence. *Concerning what I learned about my host country people and myself, the next time I travel to a new country, I will*…

2. Expanding on your personal and social responsibilities just a bit, think about your duty to share your recent HIE with others by finishing the following sentence. *To share more fully my host country experience with my peers, professors, and others, I will*…

3. Finally, your recent HIE really does set you apart from all other future job seekers. Think about your 30-second sales pitch to a future employer when asked in a job interview, "*What makes your HIE experience valuable to this company or to society?*" You will respond:

Approximately one week after returning from their respective HIEs, participants received personalized emails with access to the closed online survey. All participants were allowed two weeks' response time, and automated reminders were sent to non-respondents every three days (White et al., 2006). Following multiple reminders, a 74% response rate (*n* = 78) was attained. Participants' responses were extracted from the online survey, personal information was removed (i.e., if names were mentioned within responses), and all records were coded for archival storage. Each response was coded by a response number, year of participation, and country location; therefore, quoted material from the 24th participant in 2018, who studied in Costa Rica, was noted as P24CR18.

Content analysis (Fraenkel et al., 2019) was used to analyze data. This method allowed for the indirect study of responses. Data analyses helped determine if students' self-perceived employability skills confirmed those found in the literature.

Results and Discussion

Respondents were predominantly (*n* = 66; 85%) interested in study abroad programs (from summer 2017 to summer 2018) in Costa Rica (n = 34) and/or Namibia (*n* = 32); 12 (15%) studied in Greece or Poland. Females comprised nearly 70% (*n* = 54) of all participants.

Intercultural Skills

The first objective was to describe participants' personal and social responsibilities derived from participation in study abroad. Participants identified intercultural skills as an important personal and social responsibility. For example, P68N18 stated he/she believed it was a personal and social responsibility to "*interact with people of all different cultures*," and P5CR17 reported being "*better prepared to handle cultural differences*." These findings support Farrugia and Sanger (2017), who found similar intercultural skills were learned in study abroad. Intercultural skills (a.k.a., intercultural competence) are one's attitude, knowledge, behavior, and skills. Respondents reported development in all four components of intercultural competence. For example, attitude was described often as *openness toward other cultures*. P24CR18 aspired to *experience intercultural interactions with an open-mind*, which was affirmed by P10CR18:

> *Be open to the different ways people do things. For example, the way their lifestyle is, their values, behaviors, how they farm, how they communicate with people, how they use resources and their moral make-up. All of these aspects are key to making any experience in a diversifying culture enjoyable.*

Participants believed having an attitude of openness was an important personal responsibility that increased their intercultural understanding. P32CR18 described being "*more open to new experiences*" increased his/her intercultural understanding; "*Prior to my study abroad, I was sheltered from cultures other than my own*." Short-term study abroad programs help students gain valuable intercultural experiences (Conner and Roberts, 2015). Just as Conner and Roberts found in Swaziland, participants in the Namibia program had intercultural interactions that enhanced their cultural knowledge. "...*I have a new openness for learning. Namibia broke every stereotype my family kept telling me to expect while I was there*" (P46N17). P56N17 described intercultural interactions as a component of cultural knowledge by noting the importance of "*putting effort into learning about new cultures*." P77N18 stated, "*Make it a point to interact with others to learn about their culture*." Many participants who wrote about an attitude of openness believed it directly contributed to the benefit gained from the experience.

Another common trait was *curiosity for other cultures*. Participants noted their curiosity by stating they asked more questions to gain deeper levels of cultural understanding and knowledge while abroad. P57N17 described asking questions as an important part of the learning process, while P4CR17 mentioned asking questions as a way to avoid making cultural blunders. Participants engaged in intercultural interactions by asking questions while abroad, supporting Messelink et al.'s (2015) belief that cross-cultural interactions helped develop one's cultural knowledge.

Participants exhibited enhanced cultural knowledge in their descriptions of desires to understand local customs and expectations of being responsible visitors. For example, P54N17 mentioned his/her belief that it is "*respectful to visit a country and have some prior knowledge*." P1CR17 stated, "…*wanted to have fully prepared for that country and for what its people expect and anticipate from a responsible visitor*." Many participants thought that better preparation was needed for international travel (e.g., through research about the host country). Some common research topics included culture, history, and current events. P17CR18

wrote, "*The next time I travel to a new country I will take time to research where I am going and the historical and current events of the country*." A potential explanation for participants wanting to research before travel was their desire to behave appropriately to avoid committing cultural blunders. Such desires support the findings of Anderson et al. (2006), who determined short-term study abroad programs increased participant's intercultural sensitivity.

Some participants gained new perspectives about *appropriate behavior* during intercultural interactions, supporting the works of Conner and Roberts (2015) and Messelink et al. (2015). P50N17 wrote, "*I will try and research more about the culture prior to leaving the United States…I was not prepared for the overwhelming friendliness of Namibians*." P16CR18 mentioned wanting to "*try every food that is suggested, learn more of the basic language beforehand, and research more of the current events*." Participants believed they had personal responsibilities to behave in a "*respectful*" (P59N17) manner and "*avoid mistakes*" (P4CR17) when engaging in cross-cultural interactions.

Participants noted *intercultural skill development* through interactions with other cultures, confirming the findings of Messelink et al. (2015), who described real-life interactions as a method for intercultural skill development. "*This was the first trip where I felt like I really made a connection with the country by speaking with the people who actually live there*" (P74N18). Participants further described the value of real-life interactions by emphasizing the importance to "*embrace the culture*" (P13CR18) and "*be prepared to fully immerse*" (P14CR18) when engaging cross-culturally.

Communication Skills

Participants gained *enhanced communication skills* through intercultural interactions in their study abroad programs. P23CR18 noted the study abroad experience taught him/her "*how to communicate and work with people from other cutlers* [sic] (i.e., cultures)." P2CR17 stated the experience exposed him/her to "*various and positive methods of interpersonal communication*." These findings support Gaia's (2015) study, which noted short-term study abroad programs effectively increased communication skills.

Participants developed their *nonverbal communication skills* through their study abroad experience. They mentioned the importance of having a cross-cultural understanding of nonverbal communication, consistent with the findings of Bonaccio et al. (2016), who described the value in possessing cross-cultural nonverbal communication skills. P8CR18 wrote, "*Non-verbal communication was constantly used to convey respect, appreciation, and genuine interest.*" Understanding nonverbal communication across cultures can decrease the likelihood participants commit culturally inappropriate blunders.

Participants discovered the importance of *interpersonal communication skills*, such as understanding their audience, from their study abroad experiences. A common theme was a desire to learn basic phrases in local languages. P11CR18 stated, "*I will try more to speak the language*" and P23CR18 wrote, "*I will try to better understand the native language so I can communicate better with locals*." Participants believed demonstrating an effort to learn some basic language was valued by host-country locals.

Many participants noted the importance of communicating through sharing of photos and stories. P21CR18 wrote, *"I think that the best way to share experiences is by telling stories about those experiences. Words and photos can do both of these things*." P25CR18 mentioned photos greatly enhanced the story being shared. These findings support Farrugia and Sanger's (2017) definition of communication skills.

Self-Awareness Skills

Participants noted *heightened self-awareness* because of their study abroad participation. Morin (2011) described an aspect of self-awareness involving altering one's behavior through self-regulation, which was demonstrated by the statement, "*I must learn to maintain composure and that their ways are not necessarily our ways"* (P59N17). Participants described self-awareness skills as something not solely derived from interactions with host-country nationals, but from peer interactions too. For example,

> *I will be more aware of not only my interactions with the culture, but the people I am traveling with. I felt like about half-way through the trip I started taking notice of the other members of our group and the way they reacted to the culture, I felt like I got more out of the experience by doing this.* (P72N18)

Participants reflected on experiencing new and unfamiliar cultures, and on the value of being willing to step out of their comfort zones. P24CR18 described the effectiveness of being "*willing to step out of your comfort zone*," while P55N17 considered a willingness to experience other cultures as a contributing factor to personal growth.

Participants reported greater understanding of preconceived stereotypes. Many students admitted to having stereotypes about the country they visited, host-country nationals, culture, and safety of the location. "*Namibia broke every stereotype my family kept telling me to expect"*(P46N17). P67N18 recognized stereotypes in his/her writing as

> *… the stigma of hostiles and danger in other countries is not as prevalent as we want to think. I was told so many ugly things from so many people before I left that honestly scared me. People are very uninformed and very opinionated, especially if they have not traveled out of the country before.*

Participants described their study abroad experiences as critical in disproving stereotypes. Some derived a personal and social responsibility for advocating against stereotypes, as P50N17 wrote,

> *I am going to share my pictures. This is the best tool that I have available in order to be an ambassador for Namibia. Although most of my pictures are not as hard hitting, they will still break the stereotypes that a lot of Americans place on Africa as a whole.*

Participants' awareness and negation of stereotypes demonstrates increased global competencies, a known outcome from study abroad participation (Zhai and Scheer, 2010).

Professionalism

Participants reported development of *professionalism*. P18CR18 stated he/she had learned "*important tools of professionalism*." P41G17 mentioned an improved ability to "*interact with others in a professional setting*." Participants noted that appropriate behavior was needed in cross-cultural settings, which is a noted attribute of professionalism (Robles, 2012).

Self-perceived Employability Skills

The second objective was to explain which skills participants believed might be useful when seeking employment. Many believed they had gained an important employability skill (i.e., *global awareness*) from participation in study abroad. P68N18 believed the study abroad experience helped him/her bring a "*global outlook*" to a company, while P63N17 mentioned the experience enabled him/her to "*become more culturally aware*," skills they believed employers should consider during the hiring process. Participants' increased global perspectives were consistent with the findings of Briers et al. (2010), Chang, et al. (2013), Stroud (2010), and Zhai and Scheer (2010). Those previous studies found students who studied abroad also believed those experiences made them more competitive in a global job market.

Participants believed that engaging in a study abroad experience provided real-life experience, while also revealing a lack of cultural awareness. P5CR17 stated their experience in Costa Rica allowed them to gain "*real world experience.*" P73N18 noted,

> *Before this trip, I did not have a global mindset in any way shape or form. After my trip, however, I am able to say that has changed… I think this experience is valuable to any company because it shows that I am willing to travel to learn more and educate myself on issues.*

Another self-perceived benefit derived from study abroad participation was a *willingness to step out of their comfort zone*. P10CR18 wrote, "*I was able to step out of my bubble, out of my comfort zone*." P20CR18 stated he/she learned the importance of being "*willing to go outside of your comfort zone*." Participants believed that getting out of their comfort zones was a valuable experience personally, and perhaps professionally. P30CR18 described this benefit as:

> *My HIE experience is valuable to this company because it shows that I am willing to take on unfamiliar challenges. It shows that I have a desire to learn new things and that I am able to adapt. I am not afraid of taking risks and stepping out of my comfort zone.*

P62N17 believed his/her cross-cultural experiences in Namibia provided opportunities to develop valuable career skills such as a "*high level of flexibility*," and the ability to "*adapt to new situations well.*" Harder et al. (2015) described flexibility and adaptability as career skills desirable to employers. Our findings confirmed those of Chang et al. (2013), who found students' willingness to study abroad was significantly positively correlated with their perceived competitiveness in the global marketplace.

Participants noted an *increased acceptance of diversity*. P9CR18 mentioned he/she learned how to better "*accept differences*" and approach new people with an open mind and optimism. P9CR18 further described his/her increased acceptance and openness as "*valuable traits*," which he/she believed to be directly transferable to the workforce. Farrugia and Sanger (2017) noted the ability to understand individual and cultural differences as an important employability skill derived from study abroad. Many participants described enhanced abilities to interact with people from various backgrounds. P2CR17 reported being able to relate better to people with "*different backgrounds and social upbringings*." P52N17 mentioned engaging in cross-cultural interactions allowed him/her to be more "*accepting of our differences*."

Participants realized cross-cultural interactions helped them relate better to populations that are more diverse. P27CR18 wrote, "*when I meet a person from a different place or with a different culture, I do not think how can I accommodate them, I think how can I relate and build a relationship with them*." Participants demonstrated an increased openness to other cultures, such as P18CR18 stating he/she learned the "*importance of cultural pluralism*." These findings align with those of Gibson et al. (2015) and Zhai and Scheer (2010), who noted study abroad participation may lead to increased openness to cultural diversity.

Summary

Participants perceived employability skill gains (global awareness, flexibility, adaptability, and intercultural skills, such as increased acceptance of diversity) from selected study abroad programs. Several described their participation as a valuable experience that should be considered by employers. We recommend HIEs such as study abroad be developed and administered to emphasize future employment skills, which will help participants more easily transfer such skills to future workplace settings. If HIE programs contain a "future employability skills aspect," then students will be less likely to view their international experiences in a vacuum. Students will be empowered to "leverage their study abroad experiences when applying for jobs, internships, or graduate school admissions" (Chang et al., 2013, p. 102).

College of agriculture educators can help students prepare for diverse workplaces through agriculture-focused, short-term, study abroad programs. When such programs are unavailable, educators can include intercultural interactions in on-campus courses using web-based materials (e.g., YouTube videos, etc.) that explore culture as an essential element for success in the global agricultural industry.

Global awareness, a common theme in participants' personal and social responsibilities, was deemed beneficial to society, such as P22CR18's statement, "*my exposure to a different country has broadened my worldview*." When students gain broadened worldviews, societies become more understanding and accepting of intercultural differences worldwide. This precept was found in P73N18's writing,

> *I believe my experience is valuable to society because I have developed a care for the global spectrum. I realized that I only cared about America before this trip; I was unaware and uneducated on other issues in our world. After going to another continent, I feel I am now better educated and have knowledge that can help others discover and embrace another culture and mindset.*

This study enlightened us about students' self-perceived, specific employability skills that were gained from study abroad participation. What remains unknown is what agricultural employers believe our students' employability skills gained from study abroad. Specifically, a need exists to measure accurately those soft skills deemed most beneficial by agricultural industry employers, for entry-level employment (see Chang et al. 2013). The same research is needed among leaders of community organizations so study abroad programs equip learners to become positive members in diverse societies.

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Evaluating Intercultural Competence in a Combined Learning Community Study Abroad Program

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Abstract

Undergraduates studying in agricultural fields must be prepared to navigate in a global society. In this environment, intercultural competence skills are crucial characteristics sought by employers. Study abroad programs using deliberate intercultural interventions provide opportunities to develop such skills. A learning community-centered study abroad program was developed for incoming first-year and second-year agricultural undergraduate students. Nineteen students visited Italy for 10 days in July 2018 with the intent of becoming familiar with global animal production practices. Following the in-country portion of the course, students met throughout the fall (2018) semester completing intercultural-related assignments. To assess intercultural competence of students throughout the course, the Intercultural Development Inventory was administered three times: one week prior to travel, week one of the semester, and the final week of the semester. Group intercultural competence did not significantly increase though there was stage progression on the Intercultural Development Continuum. Despite limited group growth, a wide range of individual movement was observed. Individually, 42% of the students advanced meaningfully on the continuum and 26% of the students progressed to a new developmental stage. Results indicate that students respond to cultural interactions differently, which emphasizes the need for intentional support throughout study abroad programs.

Introduction

Food is interwoven into all cultures. How food is produced and how it reaches consumers, however, has become highly globalized. At the same time, U.S. population demographics have shifted considerably, with both urban and rural areas becoming more diverse. In the last five decades, over 59 million immigrants to the U.S. have shifted population demographics, globalizing local communities, and it is estimated to continue in this fashion (Cohn and Caumont, 2016). In addition, less people are directly involved in production agriculture in economically flourishing countries (Roser, 2018). However, dependency on the industry is sustained with one-third of the world population relying on agriculture for their livelihood (Lambert Snodgrass et al., 2018). As such, current agricultural students must become more globalized themselves in order to successfully navigate across cultures both internationally

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Increased diversity can be seen throughout agricultural industries and throughout agricultural education (Lambert Snodgrass et al., 2018). In turn, U.S. land grant universities have increased efforts to recruit and retain underrepresented minorities in an effort to build student populations that better reflect the communities they serve (USDA-NASS, 2012; Roberts et al., 2016). In addition to ethnic diversity, U.S. communities are also aging, with overall populations growing in numbers (Cohn and Caumont, 2016). As our communities continue to evolve, those wishing to make an impact in agricultural fields or careers must learn to successfully communicate, operate, and thrive across multiple cultures.

Change always introduces uncertainty, but future industry leaders must possess the skills necessary to embrace these challenges in order to facilitate positive reactions to change. Intercultural competence is likely first among the skills necessary to navigate change in this context. While universities have traditionally prepared students with the technical knowledge needed in different agricultural fields, the university can also provide opportunities for students to improve in intercultural competence, allowing them to negotiate their technical skills with different audiences around the world and at home. In order to equip students with skills to be successful, deliberate activities should be implemented to provide an understanding of and experience with navigating cultural differences. One of these targeted activities is participation in study abroad programs. Cultural immersion experiences are promoted in educational settings as a means to develop intercultural competence (Bennett, 2010; Vande Berg and Paige, 2012).

Schmidt and Pardo (2017), through a longitudinal study of study abroad participants, found that experiences abroad did provide exposure to unfamiliar cultures and opportunities to develop language skills. Their study, however, concluded that while study abroad has some benefits, the experiences had no greater effect of developing human capital (i.e. skills, knowledge, and experience) than remaining at the local campus (Schmidt and Pardo, 2017). The immersion assumption highlights the gap between studying abroad and the production of students prepared to successfully function in a global society. While participation in study abroad has increased substantially among college-aged students, most programs provide an immersion experience at best. Study abroad experience does not necessarily translate into the development of intercultural skills that most programs intend and claim to provide (Bennett, 2010; Hammer, 2012; Vande Berg et al., 2012).

Most coordinators of study abroad programs have developed an understanding that educational intervention and intentional support for students are a necessity that facilitates skill development (Vande Berg et al., 2012). Study abroad can provide students with an environment of unpredictability, which, in turn, provides educators with an opportunity to institute learning interventions, potentially enhancing the development progress of the students (Stuart, 2012). In practice, these interventions may include, but are not limited to, providing means to better engage with the host culture, allowing students to reflect on interactions and experience, and focusing on intercultural learning throughout the entire cycle of the study abroad program (Vande Berg and Paige, 2012).

Throughout U.S. universities, learning communities (LC) are often used as another method to better engage undergraduate students in their own learning (Lenning et al., 2013). LCs are utilized to organize and facilitate specific learning experiences and address university concerns related to student engagement by creating communities of individuals with like-minded academic interests (Jessup-Anger, 2015). The study abroad program described here, developed a learning community in order to compliment the study abroad experience as a means to provide more structured and continual intercultural intervention. It was hypothesized that this structure would lead to quantifiable increases in intercultural competence.

Engaging agriculture students in intercultural competence development, this study abroad program utilized structure supported by intercultural and study abroad research in its design. The short-term study abroad program was completed and followed by a reentry course. The program included reflections, simulations, and skill-building exercises that have been successful in previous programs (Vande Berg et al., 2009; Jackson, 2015). The domestic course following the international experience is critical to helping students understand their experiences and process successfully for maximizing developmental opportunity (Bathurst and Brack, 2012). Given the increase in undergraduate participation in study abroad programs, an opportunity exists to develop the skills needed to navigate a multicultural workplace (Institute of International Education, 2017). There is limited research specifically focused on the development of intercultural competence among students in agriculture (Lambert Snodgrass et al., 2018). This study evaluates intercultural competence development in a group of agricultural students studying animal production in Italy.

Theoretical Framework

The theoretical framework utilized in designing this study is Hammer's (2015) Intercultural Development Continuum (IDC). The IDC is a model that describes how individuals operate while encountering cultural differences. It is a continuum that is separated into monocultural (i.e. using own cultural views as the basis for reality) and intercultural mindsets (i.e. using the context in order to make inferences) (Bennett, 2004). It is from these mindsets that people view differences and interact with others. Each developmental stage is correlated with a number provided by the instrument used in congruence with the IDC, the Intercultural Development Inventory (IDI).

First recognized as the Developmental Model of Intercultural Sensitivity (DMIS), the IDC emerged with significant adjustments including changing the model from 6 stages to 5 and declaring that one stage is now to be seen as a transitional stage. The IDC's 5 stages are denial, polarization, minimization, acceptance, and adaptation. Denial and polarization fall within the monocultural mindset category while minimization is the transitional orientation to the intercultural mindsets including acceptance and

adaptation (Hammer, 2012). However, the concept and key principles of the IDC remain true to the DMIS in its effort to conclude how individuals experience difference in varying cultural contexts (Hammer, 2015).

Throughout this research study, teaching methodologies aimed to support students' movement along this developmental continuum. This theoretical framework was integrated into course design, assignment choice, and instrumentation chosen for analysis. The IDI was utilized to measure how the implemented interventions influenced the stage development of participants. The IDC offers a lens through which to view and interpret the presented findings.

Purpose and Objectives

The purpose of this study was to assess the outcomes of an LC-based study abroad program on students' intercultural competence. Specifically, we aimed to measure students' intercultural development over time, from before participating in the study abroad, immediately after, and through their completion of an allied 16-week course the following semester.

Materials and Methods

Course Information

The Purdue University Institutional Review Board approved all study experimental methods. The LC-based study abroad program focused on food animal production in Italy and was developed and delivered in the summer and fall semesters of 2018. Nineteen undergraduate students participated in the program. Student participation was restricted to first-year students (26.3% of total; n=5) and second-year students (73.7% of total; n=14) pursuing BS degrees in Animal Sciences or a related major. Students (n = 19) were 94.7% female, 5.3% male, and 100% were United States citizens. Advertisement for the trip was provided in introductory courses across the department as well as study abroad fairs. Students were selected based on a GPA of 3.0 or higher and a first-come, first-serve basis.

The program consisted of two credit-bearing courses in succession and all students were required to enroll in both courses. In the first class (2 credit hours), students traveled throughout Italy for 10 days in July 2018. Students completed the second course (1 credit hour), which took place on-campus in the fall semester immediately following the study abroad and students met once a week for 50 minutes for 16-weeks. While focusing on discipline content, teaching methodologies were also implemented to engage students in intercultural competence development. The itinerary of activities during the study abroad portion of the program is provided in Table 1. Throughout the activities, students interacted with agricultural professionals to learn about different food production practices including dairy, Parma ham, and sheep production as well as a variety of cheese processing. In addition, students engaged in multiple cultural tours to learn the history of cities in which they visited.

Course Assignments

Throughout the study abroad and on-campus portions of the course, students were required to complete all LC-related assignments. The LC portion of the course did not have an intercultural learning component but was focused predominately on career opportunities and professional development. These included attendance at LC sponsored extracurricular experiences, guest speaker presentations on career options and global agricultural topics, and community outreach events, designed to focus on exposure to career opportunities, involvement in service-learning projects, and collaborative learning with peers (Table 2). During the fall semester, students completed an outreach project that challenged them to create hands-on stations focused on animal agriculture using both international and domestic contexts. Students then engaged over 200 local elementary students with their hands-on stations during weeks 13 and 15 of the semester.

Students also engaged in intercultural learning (ICL) activities throughout the program (Table 2). These activities were designed to provide opportunities for students to reflect on cultural self-awareness and awareness of others. Stuart (2012) emphasizes the criticality of taking developmental stage into account while designing intercultural learning opportunities. Developmental stages of students influenced the choice of our activities. One example, the 'Name Game' is appropriate for the intercultural development stages in which the majority of participants fell prior to the study abroad (denial, polarization, and minimization) with the objective being for students' to understand the importance of names in regards to identity and cultural variations in naming (Stringer and Cassiday, 2009).

Furthermore, examples of ICL activities included the following: Scenery, Machinery, People, the Ethnic

Table 1. Itinerary for Italy Study Abroad from July 21-July 31, 2018.

Day	Activity
1	Depart U.S./Arrive in Milan Milan Cultural Immersion
2	Tour University Dairy Farm
3	Sheep Production in the Alps
4	AI center for Brown Swiss Verona Cultural Immersion
5	Parmigianno Reggiano Cheese Production Dairy Farm Management
6	Parma Ham Production Balsamic Vinegar Production
7	Visit Sheep Farm
8	Florence Cultural Immersion
9	Venice Cultural Immersion
10	Depart/Arrive in U.S.

Table 2. Semester Learning Activities and Assignments in an Animal Production Study Abroad/Learning Community Program.

	Activity Title	Activity Focus	Week(s) of Semester
ICL Activities	Journal	Self-Awareness	SA*
	Name Game	Self-Awareness	SA*
	Who am I?	Self-Awareness	SA*
	IDI** Debrief/ IDP***	Self-Awareness	3
	Alpha/Beta Simulation	Awareness of Others	8
	Scenery, Machinery, People	Self-Awareness	10
	Market Visit	Awareness of Others	10
	Reflections	Self-Awareness/Awareness of Others	SA*, 9, 10, 15
LC Activities	Speaker from Duck Industry	Career Oppurtunity	2
	Guest Professor from Extension/ Microbiology	Global Perspectives	5
	Speaker from Poultry Association	Career Oppurtunity/Global Perspectives	6
	Speaker from Swine Industry	Career Oppurtunity	9
	Guest Professor from Meat Science	Global Perspectives	11
	Speaker from Dairy Nutrition Company	Career Oppurtunity	14
	Community Outreach Project	Service Learning	13, 15

*SA: Study Abroad (10-day travel in Italy) portion of the program. **IDI: Intercultural Development Inventory (IDI, 2018). ***IDP: Intercultural Development Plan (IDI, 2018).

Market Assignment, and the Alpha/Beta Simulation. The activity "Scenery, Machinery, People" includes reading an anthropological article by Jones (2017), discussing how people interact with and view different people in everyday life, before having students reflect on and discuss with their peers about how they categorize others in their environment. The goal of this activity is for students to become self-aware of the process of categorizing others, articulate how instinctually humans do this and recognize the influence of empathy on relationship building. Reflective journaling was utilized to promote self-awareness by engaging students with specific prompts and giving space to students to process their experiences as encouraged in the literature (Bennett, 2010; Jackson, 2015; Vande Berg et al., 2009).

Additionally, students were prompted to complete the "Ethnic Market Assignment" in which they had to visit an Ethnic market in the local community to purchase an item for a recipe of their choosing. This was designed to have students enter an unfamiliar environment that required them to assess their cross-cultural skills and experience. They were then required to respond to reflective questions including "how did you feel going to the market of your choosing?" and "what do you believe made you feel this way?" Lastly, the Alpha/Beta simulation divided students into two groups requiring them to follow specific guidelines on how to interact. Each groups' guidelines simulated different communication styles as well as collectivist and individualist characteristics. The groups had to decide on how to allocate funds to members of an organizational team and then propose their decisions to the other team. When intermingling, teams were required to compromise. Students were allowed to discuss difficulties that arose as well as assess how they used their skills to compromise during the debriefing session. Intercultural learning activities used in this study can be accessed at the Intercultural Learning Hub (HUBICL and CILMAR, 2018).

Assessment of Program

Students' intercultural development was measured over time using the IDI to determine where both individuals

and groups were placed on the IDC. The IDI is a 50-item inventory that is widely used in cross-cultural assessment and program evaluation (IDI, 2018). The quantified results of the IDI are a measure of intercultural sensitivity and are reported as numbers indicating an individual or group's Perceived Orientation (PO), Developmental Orientation (DO), and Orientation Gap (OG). DO signifies the objective stage from which the participant operates when encountering cultural difference while the PO is the subjective view or stage from which the participant believes they navigate cultural difference. The PO and DO are associated with one of the 5 developmental stages on the IDC, denial (55-70), polarization (71-85), minimization (86-115), acceptance (116-130), and adaptation (131-145), while the OG represents the difference between the PO and DO. This study includes all PO, DO, and OG results. Furthermore, variations are provided on individual participant DOs in exploration of this objective view of the stage from which students operate when encountering cultural differences.

Students completed the IDI online at three different times in the program: one-week prior to international travel (T1), week 1 of the Fall semester (T2; 1 week after completing international travel), and week 15 of the companion course in the Fall semester (T3). Three time points were selected in order to distinguish development based on international travel versus development that could occur (or increase) during the on-campus course.

Statistical Analysis

Paired sample t-tests were carried out on the IDI results of all students to identify the presence of statistical significance (SPSS Statistical Version 25). However, IDI (2018) indicates an individual change of 7 points or more is meaningful. Analysis was performed upon the DO, PO, and OG from T1/T2 and T1/T3. T-tests were not completed on T2/T3 in order to refrain from compromising statistical validity (i.e. decreasing risk of type 1 error). T2 remained a placeholder to identify any significant change from pre- to post-travel (i.e. T1/T2). Effect size was also evaluated for student IDI assessments. Differences were considered statistically significant at $p < .05$.

Results

Individual Developmental Orientation

There were three time point results for each of the quantitative outcomes of the IDI for the group (Table 3). Of the 19 student participants, 42.1% (n = 8) progressed meaningfully (i.e., moved forward 7 or more points) in their DO from T1 to T3, while 10.5% (n = 2) decreased meaningfully, and 47.4% (n = 9) remained neutral. Five students' DO (26.3%) moved (progressed or regressed) from T1 to T2 by 7 points or more, while the rest of the program participants' DO remained the same. Three of the eight students that progressed between T1 and T3, progressed over 14 points, twice the amount identified as meaningful by IDI (2018). Of the participants, 26.3% (n=5) transitioned forward into a new stage on the IDC between T1 and T3.

The developmental stages of individual participants changed from T1 to T3 (Table 4). The number of students in the denial stage increased with the regression of one student from polarization. The number of students in the acceptance stage increased with two students progressing from minimization (from 0 students at T1). No students began in, nor progressed to, the adaptation stage on the IDC. Lastly, the effect size calculated for this evaluation of developmental orientations (DO) was a Cohen's d = 0.27. This is considered a small effect size (Walker, 2008).

Table 3. Intercultural Development Inventory results of the Perceived Orientation (PO), Developmental Orientation (DO), and Orientation Gap (OG) from 19 undergraduate student participants in a short-term study abroad program.

	T1	T2	T3
PO	117.75	117.61	119.79
DO	83.55	83.04	87.74
OG	34.20	34.57	32.05

Group Developmental Orientation

While it is important to report and evaluate the individual development, overall progression on the IDC as a group was limited and there were no statistical changes. Little variation was observed in the group perceived orientations (PO) between T1 to T2 (117.75 vs. 117.61) and T1 to T3 (117.75 vs. 119.79), and the group PO remained in the acceptance stage at all three time points. There were no statistically significant differences in group PO between T1/ T2 and T1/ T3. Similarly, group developmental orientation (DO) was not significantly different across the three time points (83.6, 83.0, and 87.7 at T1, T2, and T3, respectively). The group remained in polarization from T1 to T2, while crossing the 85-point threshold to low minimization at T3. The orientation gap (OG) also showed little variation across the three time points, and no significant differences were detected between T1/T2 and T1/T3.

Discussion

As a group, the participants in this study were primarily categorized in the monocultural mindset of polarization from T1 (53%), T2 (42%), and T3 (47%) and secondarily categorized in the transitional stage of minimization from T1 (42%), T2 (37%), and T3 (32%). The results of this study are similar to others, supporting the premise that undergraduates, on average, approach cultural differences from the developmental stages of minimization or polarization (Anderson et al., 2006; Sandell and Tupy, 2015). In this mindset, differences are viewed as "us versus them", and encounters with difference seem uncomfortable (Bennett, 2004; Hammer, 2012). Hammer (2013) suggests that individuals in this category see cultural differences as an obstacle and exhibit behaviors such as placing themselves in a superior light in comparison to others and using polarizing language. One example of this type of response to difference in our study was seen in a participant's

Table 4. Percentages of the 19 undergraduate student participants composing each developmental stage on the Intercultural Development Continuum from pre (T1) to post (T3) study abroad program.

Stage	T1 (%)	n	T3 (%)	n
Denial	5	1	11	2
Polarization	53	10	47	9
Minimization	42	8	32	6
Acceptance	0	0	11	2
Adaptation	0	0	0	0

response to the [Ethnic] "Market Assignment" noting they "…felt out of place due to being one of the few there not of Asian background. The fact that I couldn't understand many of the food items, or even read them, was also something that made me feel a tad uncomfortable."

A large percentage (T1 = 42%, T3 = 32%) of students were in the transitional minimization stage. The Georgetown Consortium, which includes 61 programs with 1297 student participants, is the largest study of cultural immersion (study abroad) and outcomes relative to intercultural competence of undergraduates (Vande Berg et al., 2009; Vande Berg and Paige, 2012). They reported that the student average was in the minimization stage. This stage is identified by emphasizing common cultural practices and values as a way to interact with people from different backgrounds, which can minimize cultural differences (Bennett, 2004; Hammer 2012). In response to the "Market Assignment", another student used minimizing language saying "I feel like visiting this [Asian] market was like visiting any place in Italy." This generalization can have unintended outcomes. While students may feel successful navigating differences, bridging cultural gaps by solely focusing on common ground can dismiss the importance of diversity, the influence of difference on cultural identity, and indicates their perspective and values are absolute (Bennett, 2004; Hammer, 2012; Hammer, 2013)

On the other hand, our participants who progressed to acceptance from T1 to T3 (11%) are believed to have developed the skills needed to appreciate and emphasize understanding of diversity and cultural complexity (Paige et al., 2003; Hammer, 2012). The skills needed to understand different perspectives are important in creating solutions cross-culturally for issues in agriculture such as sustainable food production (Lambert Snodgrass et al., 2018). In relation to group PO, the students in our program believed they operated from the stage of acceptance, while mostly operating from a stage of polarization, which suggests an overestimation of intercultural communication skills. Disparity between PO than DO (i.e. large orientation gaps) is common across IDI research (Altshuler et al., 2003; Pedersen, 2010; Karcher et al., 2013; Jackson, 2015; Lambert Snodgrass, 2018). There are implications of the overestimation of intercultural competence, however, including potential disregard of global and domestic diversity issues as well as the limitation it places on students' ability to effectively learn and retain knowledge (Dunlosky and Rawson, 2012; Hammer, 2013). When there is belief one is already at a progressive stage developmentally, even if it is not necessarily the case, there is little reason to engage in or seek opportunities to increase skills to get to the next level.

Limitations of short-term study abroad programs (defined here as anything less than a semester-long) in comparison to longer term programs include: restricted time to incorporate cultural-related activities, minimal opportunities or time to cultivate cultural learning, limited immersion and time in the local community to develop cross-cultural communication skills, and student experience is largely controlled by faculty (Mapp, 2012; Cubillos and Ilvento, 2018). The duration of the study abroad program is often believed to influence intercultural competence development; however, this influence may not be absolute. Czerwionka et al. (2015) showed that U.S. students' intercultural development increased through their participation in a short-term study abroad program to Spain, while Anderson et al. (2006) found no significant increase in intercultural development in US students who participated in a short term program to England and Ireland. Though movement occurred on the IDC, outcomes did not influence a change of developmental stages. Cultural visits, speakers, and home-stays were implemented throughout Anderson et al.'s (2006) program. Fabregas-Janeiro et al. (2011) observed that their short-term study abroad participants (n=99) displayed no difference in intercultural development on the IDI in comparison to their counterparts participating in the on-campus intercultural program and control group. While there was specific discussion about interaction with other cultures throughout the five programs they evaluated, Fabregas-Janeiro et al. (2011) did not provide examples of specific intercultural learning activities. The authors concluded that future programs should incorporate deliberate methods to engage students in cultural learning similar to those used in the present study (e.g. role-playing, journaling, reflective essays, and cultural visits).

Terzuolo (2018) found that a group of 108 students independently (i.e. not faculty led or cohort based) studying for a semester abroad (i.e. long-term) showed statistical significant improvement in intercultural competence development on the IDI. Students in these programs were not required to complete specific activities or assignments.

Program duration impacts student development, indicating that long-term programs might be more likely to increase development of intercultural competence and global-mindedness (Kehl and Morris, 2008; Vande Berg et al., 2009).

These findings suggest that program duration could be a factor in growth patterns among students in our program. Bathurst and Brack (2012) suggest that a follow-up course can be used and should be designed to engage students in processing their international experiences and stimulating development. Our program incorporated a semester long course following the 10-day study abroad. There was a larger increase in group stage development from T1 (DO=83.55, polarization) to T3 (DO=87.74, minimization) than T1 (DO=83.55, polarization) to T2 (DO=83.04, polarization) and individual stage movement from T1 to T2 (26.32%) and T1 to T3 (42.11%). This increased variation was expected with the incorporation of a follow-up course. Though there were individual differences, no statistical difference was indicated by group results.

Rust et al. (2013) emphasized the importance of and support for the use of intercultural coursework to facilitate learning. Activities utilized in the on-campus portion of the Italy semester course were selected to engage students in self-reflection and cultural experiences according to intercultural development studies and group IDI results. These activities are supported by Passarelli and Kolb (2012) who suggest providing activities and assignments founded in experiential learning as a means to engage students in the process of developing intercultural competence. The visits (e.g. Market Visit) and simulations (e.g. Alpha/Beta) provided the concrete experience that students were then required to reflect on, conceptualize in class discussion using the Thiagi (2015) debriefing method, and experiment with the next cultural activity. It is critical to structure study abroad programs in a way that provides clear opportunities for student intercultural development throughout program participation in programs (Hammer, 2012; Goldoni, 2015).

The lack of contact between students and program leaders prior to the international experience limited the ability of leaders to prepare students prior to the international component. This may have contributed to the limited overall group movement on the IDI. The intermediate group results of the IDI (T2) did not show a difference in DO from the beginning to the end of the international component (T1), despite deliberate activities during the international experience designed to develop intercultural competence. The result of a numerical increase in DO from T1 to T3, though not statistically significant, emphasizes the critical time provided in the follow-up course to engage students in developing skills and processing study abroad experience as suggested by Bathurst and Brack (2012). Without having the aforementioned benefits possible with long-term study abroad programs, which afford students a greater opportunity to develop stronger relationships cross-culturally (Kehl and Morris, 2008), a post-course can be a space in which students can better develop an understanding of their intercultural experiences through activities designed to stimulate learning. The additional support of the on-campus semester portion of the program may have contributed to individual movement from T1 to T3 (42.11%) on the IDC. Similarly, Pedersen (2010), who administered a post-IDI one month after study abroad return, reported that students need sufficient time to process and grow from their international experiences. A delayed administration of the IDI could identify further group progression.

Of the 19 program participants, the DO of 2 students regressed on the IDC. While this is a small percentage of the group (10.5%), there are several explanations for why this phenomenon may have occurred. The international experience has the potential to induce instability for students due to the drastic change in their environment (Stuart, 2012). While intercultural learning activities were implemented to support students in developmental progression during this period of change, each student is unique and experiences study abroad based on individual cognitive, emotional, and behavioral factors (Lee and Negrelli, 2018). Our class was composed of incoming and current first-year undergraduates. Students in this stage of their undergraduate careers are often forced to become more self-reliant due to their transitioning to greater independence of the college environment. This is a critical time for support in order to be successful in this transition. However, this is in addition to support needed in facing cultural challenges during the study abroad program (Stuart, 2012). Providing sufficient support and stimulating engagement through challenges are key components to adjustment and development from study abroad, and it is important to provide supportive and safe areas in which to engage students in the process (Bennett, 2010). Our course was designed to provide that space through a semester-long course where students completed intercultural assignments and activities in order to continue learning from their international experience.

In addition to the factors already discussed, the international location of a program potentially influences student intercultural development. Traveling to a country with vastly different values, norms, and identities compared with those of program participants, can result in increased cognitive dissonance, a trait important for growth (Lee and Negrelli, 2018). During the 2016-2017 academic school year, Italy was the second most visited study abroad destination by U.S. participants (Institute of International Education, 2018). This destination kept our students, whom all identify as American, within a Western culture and developed country. Developing countries may have a much greater effect with respect to facilitating growth in cognitive development and engagement (Horn and Fry, 2013). Students from developed countries traveling to developing countries gain more international perspective and cognitive and personal growth compared with peers selecting programs to developed countries (Thompson et al., 2000). U.S. students also tended to select destinations where they can still function by only speaking English (Thompson et al., 2000). The exact relationship between study abroad destination and intercultural competence development needs to be further explored. European destinations are the most popular for U.S. students, but developing destinations provide different perspectives from which to teach and learn and can influence intercultural development (Tarrant et al., 2011).

Summary

This innovative program combined a short-term international experience with a semester long LC course. Although a large percentage of individual students moved on the IDC, group DO did not change throughout the course of the program. One limitation of this study is the small sample size and caution must be taken to limit generalization. However, 42.1% of program participants progressed meaningfully on the IDC. Opportunity exists in short-term study abroad programs to develop undergraduate student intercultural competence, a skill that is required for students planning careers in an agricultural related field. Future research is needed to better understand the impact of pre-departure support on student development during the international experience. Additionally, information is needed on how to best structure the LC experience to enhance intercultural development during cultural immersions.

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