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Evidence for Experiential Learning in Undergraduate Teaching Farm Courses

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Higher education institutions are attempting to use teaching farms to provide hands-on learning experiences to students, but there is a lack of research on the degree of cognitive engagement at teaching farms. Kolb's model provided the theoretical framework for assessing evidence of experiential learning in courses using teaching farms. Qualitative methods were used to examine syllabi from courses that use teaching farms at higher education institutions. Syllabi were collected using a snowball sample. Overall there was evidence for the presence of both concrete experience and active experimentation in the syllabi. Practitioners should be cognizant of when activities are intended to facilitate students to enter the reflective observation and abstract conceptualization stages. Opportunities for experience that are included in teaching farm courses should have purpose and be more than just mere activity.

Keywords: experiential learning; teaching farm; sustainable agriculture; higher education

Introduction

Academic programs focused on sustainable agriculture are increasing at Higher Education institutions throughout the United States (Redden, 2009). Similarly, land grant institutions are making an effort to shift back to their original focus of providing education to the common person and teaching agriculture through demonstration (Parr & Van Horn, 2006). Programs in sustainable agriculture, agroecology, organic agriculture, alternative cropping systems, and food systems are becoming more prevalent in the agricultural colleges at Higher Education institutions (Thompson, 2009). In the remainder of the paper these programs will be collectively referred to as sustainable agriculture programs. Land grant universities need to establish curricula that will help prepare future agricultural professionals, growers, extension educators, and consumers to address issues in sustainable agriculture to keep up with the current trend.

History of the Land Grant University and Cooperative Extension

The Morrill Land Grant College Act was signed to initiate the establishment of agricultural colleges in the United States of America due to the demand for federally supported agricultural colleges (Campbell, 1998; Grant, Field, Green, & Rollin, 2000; Rasmussen, 1989). The original land grant institutions were not strictly technical schools, though a major focus was on practical knowledge for advancing the professions of agriculture and mechanical arts (Grant et al., 2000). The early agriculture curricula at the land grant schools were designed to educate students and prepare them with practical knowledge and skills. In 1905, Professor Liberty Hyde Bailey explained the use of university farms as laboratories to put to practice the knowledge gained through the classroom (Parr, Trexler, Khanna, & Battisti, 2007).

Demonstration Farms

Seaman A. Knapp, considered to be the father of Extension, was inspired to work with agricultural demonstration shortly after the establishment of land grant institutions

(Rasmussen, 1989). Knapp was an advocate of the demonstration of agricultural practices but more specifically the demonstration by individual farmers in order to achieve the most effective behavior change. Knapp acquired funds and used them to establish farmer-operated demonstration farms. Knapp supported the presence of an extension agent in each county to work with the active farmers and their demonstration endeavors in addition to his contributions to demonstration agriculture (Rasmussen, 1989).

Demonstration farms were used to educate farmers on better agricultural practices. Similarly, agricultural colleges utilized experiment stations to provide students with practical experiences that complemented their academic coursework (Hillison, 1996).The experiment stations were used as teaching farms and laboratories where students were able to put to practice skills they learned. Farms at the early agricultural colleges served as demonstration farms and spaces "where learning occurred and where new principles were un-covered" (Marcus, 1986, p. 27). The teaching farms were deemed the most important part of agricultural colleges by people that viewed agricultural colleges as business schools (Marcus, 1986).

In addition to experiment stations, teaching farms are currently used at institutions of higher education in similar ways to how experiment stations were used in the past. Some teaching farms are student run while others are faculty run (Parr & Van Horn, 2006; Reiling, Marshall, Brendemuhl, McQuagge, & Umphrey, 2003). For example, the Student Experimental Farm (SEF) at the University of California, Davis was formed by students due to a growing interest and concern in environmentally sound alterative agriculture practices (Parr & Van Horn, 2006). The New Farm at Rodale Institute compiled a directory of at least 44 on-campus farms at institutions of higher education (Sayre, 2005).

Sustainability

According to Parr (2009) there is an increased interest in the "social and environmental sustainability of agriculture and food systems" (p. 3). This trend may be growing due to the unsustainable qualities of conventional agriculture. Conventional agriculture commonly has the following characteristics:

> rapid technological innovation; large capital investments in order to apply production and management technology; large-scale farms; single crops/row crops grown continuously over many seasons; uniform high-yield hybrid crops; extensive use of pesticides, fertilizers, and external energy inputs; high labor efficiency; and dependency on agribusiness. (Gold, 1999, para. 7)

While there are benefits to conventional agriculture, unsustainable practices include the destruction of soil structure, pest susceptibility, environmental contamination, erosion, and loss of biodiversity (FAO, 2002). Gold (2007) added chemical resistance to the list of negative impacts of conventional agriculture. With these ramifications in mind, sustainable agriculture is aimed to be environmentally healthy, to encourage social equity, and be economically viable (USDA, 2009).

According to ATTRA, the National Sustainable Agriculture Information Service, sustainable agriculture "promotes biodiversity, recycles plant nutrients, protects soil from erosion, conserves and protects water, uses minimum tillage, and integrates crop and livestock enterprises on the farm" (Earles, 2005, p. 1). In the 1990 Farm Bill, sustainable agriculture was defined as

> an integrative system of plant and animal production practices having a site-specific application that will, over the long term: satisfy human food and fiber needs; enhance environmental quality and the natural resource base upon which the agricultural economy depends; make the most efficient use of nonrenewable resources and on-farm resources and integrate, where appropriate, natural biological cycles and controls; sustain the economic viability of farm operations; and enhance the quality of life for farmers and society as a whole. (Gold, 2007, para.3)

In this definition, the three common tenets addressed were food needs, environmental quality, and economic feasibility. Though sustainable agriculture has been defined, there are many opinions regarding what truly defines sustainable agriculture (Gold, 2007).

It is important for agriculture to respond to the needs that exist as food insecurity grows as a global issue. The Millennium Development Goals initiated by the United Nations Development Program (UNDP) holds eliminating extreme poverty and hunger as their number one goal; their seventh goal is establishing environmental sustainability. The goal deadline is 2015 (UNDP, 2010). The agricultural sector needs to modify existing practices to reach this impending deadline.

Organic agriculture is not synonymous with sustainable agriculture but rather is a form of sustainable agriculture (USDA, 2009). In the past decade, organic farm acreage has increased from around 1.3 million acres in 1997 to about 4 million acres in 2005 (Dimitri & Oberholtzer, 2009). In 2007 the United States Department of Agriculture's (USDA) National Agricultural Statistics Service reported that the majority of organic farms were considered small farms, less than nine acres (Dimitri & Oberholtzer, 2009). Higher education institutions need to be providing future agriculture leaders and producers with the proper tools as more agricultural operations are turning to organic agriculture or sustainable practices.

Teaching Farms and Sustainable Agricultural Education

Parr (2009) found students are often the drivers of the formation of sustainable agriculture curricula and teaching farms at universities. In a study looking at student preferences for learning at teaching farms, Parr found students sought to connect concepts learned in the classroom to field experiences. According to Parr, teaching farms serve as "important educational facilities for experiential learning" (p. 6).

Lieblein, Østergaard, and Francis (2004) stated that while university educators are very well versed in a specific discipline, they are often less knowledgeable on education theory. After taking a course in sustainable agriculture, Lieblein et al. (2004) proposed that the following five competencies will most likely be obtained by participating students: to "have knowledge of farming and food systems; be able to handle complexity and change; be able to link theory and real life situations; be good communicators and facilitators; and be autonomous learners" (p. 298). Recently, as more attention is being paid to sustainable agriculture, universities such as the University of California at Davis are making an effort to address topics related to sustainable agriculture through the use of a student farm (Parr et al., 2007).

Teaching farms have been focused on sustainable and organic agriculture over the past few decades (Leis, 2008). The focus on sustainable agriculture has grown and persisted due the increasing demand for education in this topic area by students and extension educators (Schroeder, Creamer, Linker, Mueller, & Rzewnicki, 2006). Learners at teaching farms are given the opportunity to have many experiences and use critical thinking to apply sustainable agriculture practices (Leis, 2008).

According to Parr and Van Horn (2006), the agricultural community wanted Higher Education institutions to provide more opportunities for education on sustainable agriculture topics. Higher Education institutions are attempting to use teaching farms to provide hands-on learning experiences to their students in efforts to return to the original mission of the land grant institution and keep up with the growing field of sustainable agriculture. Teaching farms are not limited to land grant universities (Leis, 2008). Teaching farms have the potential to offer students with practical and applicable knowledge for their future careers (Leis, 2008).

It is unclear if sustainable agriculture programs are achieving the desired educational outcomes. There is a lack of research regarding the degree of cognitive engagement and educational quality at teaching farms (Parr, 2009). This is problematic because as sustainable agriculture gains more recognition, sustainable agriculture programs are adopting teaching farms as part of their curricula. It is first necessary to assess how teaching farms are currently being used before being able to effectively plan curricula based on education theory.

Theoretical Framework

Kolb's (1984) theory on experiential learning was used as the theoretical framework for this study. This model is made up of four stages: concrete experience, reflective observation, abstract conceptualization, and active experimentation (Figure 1) (Kolb, 1984).

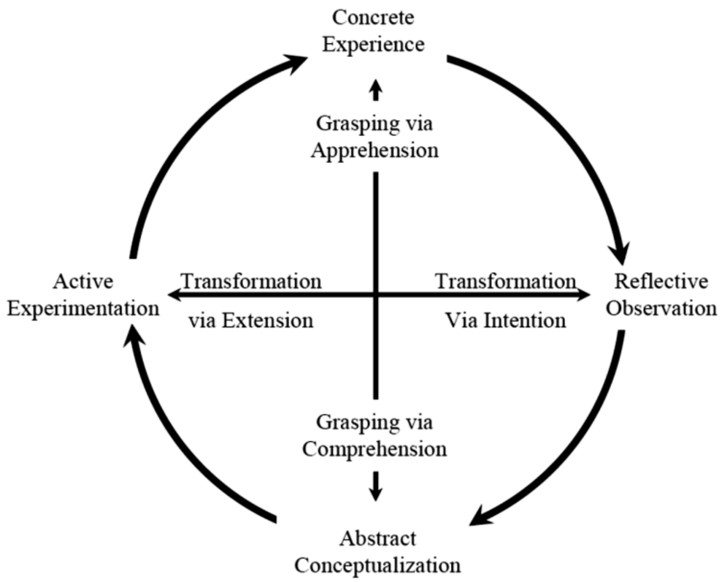

Figure 1. Kolb's model of experiential learning (Kolb, 1984)

Kolb (1984) described knowledge as something that is not static but rather is in constant flux, shaped by experience. Building on past knowledge and making connections from new experiences to previous experiences is a main tenet of experiential learning.

Experiential learning takes *hands-on* learning to another level. There is an emphasis on *doing* in the experiential learning model along with a focus on intentional reflection (Kolb, 1984). Experiential learning has been defined as "the sense-making process of active engagement between the inner world of the person and the outer world of the environment" (Beard & Wilson, 2006, p. 2). Simply participating in an educational activity is not experiential learning. The participants must be able to reflect on the experience, process the new connections, and make an attempt to apply the transformed knowledge.

Experiential learning is designed to encourage student centered learning in an attempt to move away from traditional education techniques (Dewey, 1938). The educator acts as a facilitator to help create a learning environment to enhance the learning experience (Beard & Wilson, 2006). Depending on the learners, the facilitator will offer more or less guidance (Dewey, 1938). The cyclical process indicates how learners develop knowledge by having experiences, reflecting on them, conceptualizing abstractly, and applying the new knowledge in other settings. Experiential learning can occur in a wide range of settings and disciplines (Kolb, 1984).

Purpose and Objectives

The purpose of this qualitative study was to develop an understanding of the use of teaching farms at higher education institutions in the United States. The objective of this study was to describe the evidence for the presence of experiential learning theory as indicated in syllabi of teaching farm courses.

Methods

A basic qualitative design using the constant comparative method was used to determine evidence for experiential learning theory in sustainable agriculture syllabi from teaching farm courses at higher education institutions (Merriam, 1998). Basic qualitative studies "simply seek to discover and understand a phenomenon, a process, or the perspectives and worldviews of the people involved" (Merriam, 1998, p. 11). This study used document analysis in the form of examining syllabi.

The target population of this study was all Higher Education institutions in the U.S.A. that use teaching farms for academic programs focused on sustainable agriculture. Institutions identified as having programs in at least one of the following areas: sustainable agriculture, agroecology, organic agriculture, alterative cropping systems, and food systems, collectively referred to as sustainable agriculture programs, were included in initial population frame. The population frame was created from institution lists provided by the following organizations: Sustainable Agriculture Research and Education (SARE), Rodale Institute, United States Department of Agriculture (USDA), and Sustainable Agriculture Education Association (SAEA). Contact information was obtained from institution websites. The compiled institution list contained *well-situated people* that provided contact information for the relevant faculty members involved in sustainable agriculture (Gall, Gall, & Borg, 2007).

A snowball sample was used from the institution list. Snowball sampling is used when "potential respondents are not centrally located but scattered in different sites" (Ary, Jacobs, Razavieh, & Sorensen, 2005, p. 473). The institutions were initially contacted by the researcher on September 7, 2010 via e-mail to determine the presence of a teaching farm and what faculty were using a teaching farm if one did exist. Two hundred and forty three institutions were initially contacted. Eighty institutions responded, 28 institutions indicated that they did not have a teaching farm, 39 responded that they do utilize a teaching farm, 3 identified an alternative teaching space, and 10 responded but did not clarify if a teaching farm existed. Based on the responses, seventy-two faculty who utilized teaching farms were contacted by e-mail to request relevant syllabi using the Dillman, Smyth, and Christian (2009) Tailored Design Method. A total of 110 syllabi were collected from 43 faculty. Thirty-two of the 110 syllabi were excluded because there were repeats and courses that did not use the teaching farm.

The constant comparative method, a form of content analysis, was used. Merriam (1998) described the constant comparative method as a process of "comparing one segment of data with another to determine similarities and differences" (p. 18). A researcher-created coding sheet was used based on characteristics of the experiential learning cycle and teaching farms found in the literature to guide the content analysis as there was no existing instrument (Gall et al.,, 2007; Kolb, 1984; Millenbah & Millspaugh, 2003; Roberts, 2006). The coding sheet was divided into the four sections of the experiential learning cycle. Concrete experience was divided into in class activities, on farm activities, and other field experiences. For each of those settings, direct interaction and observation were considered. For reflective observation the following categories were included: group/class discussion; assignments that allow students to incorporate previous experiences or existing knowledge; assigned readings intended to help students internalize experiences; use of a field journal or similar tool; and built in debriefing and reflection. Abstract conceptualization consisted of the following types of opportunities: opportunities for students to develop models and make hypotheses; opportunities for students to make generalizations; written reports with a discussion or synthesis component; and opportunities to make plans for future action. The final stage, active experimentation, was identified with the following themes: activities that allow students to make applications and use their own thoughts and ideas; students develop and create a project; students test hypotheses and newly made rules and apply course theories; and activities that require students to adapt to specific situations.

The initial pool of items included in the coding sheet was reviewed for content and construct validity by a panel of experts in Agricultural Education and Communication; Agronomy; and Family, Youth, and Community Sciences. Threats to external validity were addressed by using snowball sample of institutions with teaching farms in the U.S. The results will not be generalized beyond this study participating institutions. To reduce the threat to internal validity, the same coding sheet was used to assess each syllabus (Ary et al., 2005). In order to reduce the threats to construct validity, a thorough explanation of the constructs was defined based on the literature (Ary et al., 2005).

To address credibility, a thorough literature review was completed as well as consulting an expert panel regarding indicators of experiential learning in course syllabi. Lincoln and Guba (1985) explained that though the researcher is not intending the study to be generalizable, the researcher must provide "thick description necessary to enable someone interested in making a transfer to reach a conclusion about whether transfer can be contemplated as a possibility" (p. 316). Descriptions of experiential learning indicators found in the course syllabi were recorded for this purpose and included in the findings. An inquiry audit was used to ensure dependability (Lincoln & Guba, 1985, p. 318). The panel of experts received a sample of the syllabi and blank coding sheets. The researcher compared the initial findings with the panel to ensure consistency in coding. An audit trail was done as well as the inquiry audit to account for confirmability (Lincoln & Guba, 1985).

Findings

This study aimed to describe the presence of indicators of experiential learning theory as reflected in the syllabi of courses that use teaching farms. Findings are presented in the four components of the experiential learning theory model (Kolb, 1984). The findings are based on 78 syllabi collected from 28 institutions including both private and public institutions. Public institutions also included land grant institutions and community colleges.

Concrete Experience

The concrete experiences were divided into three emergent categories: *in class, on farm,* and *other field experiences*. For each category the experiences were divided between *direct interaction* in which students participated in the experience and *observation* in which the students watched, listened, and did not get involved directly with the experience. There was no evidence for *direct interaction* in class. The three *observation* experiences that were found in the *in class* category included lecture, watching videos, and demonstrations. Fifty of the 78 collected syllabi indicated a lecture component. Other courses were strictly labs.

Most of the courses had a field work or lab component. Some of the courses had field experiences in a garden or greenhouse setting. For example, syllabus 1 included student's field experiences in which students were required to participate in 7 of 10 possible field experience activities. Other courses had opportunities for students to directly interact in the farm setting. One such course stated the expectation that students should be "getting sweaty and your hands dirty in the lab portion (S24)". Farm tours and tours of facilities were found in several of the syllabi and constituted *on farm observation* activities.

Observations in *other field experiences* were comprised of field trips, industry tours, and field days to farms or locations other than the on campus farm. Field trips took place at local farms or other agricultural operations as well as on-campus facilities not including the campus farm. One syllabus offered clear detail on the types of experiences included in the field trips: "we will visit several family-run 'sustainable' operations in order to see firsthand the challenges facing organically-minded farmers" (S35).

Reading prior to lecture was emphasized in some of the syllabi. Not every syllabus that had assigned readings directly indicated that students were required to read the material before lecture. Syllabus 14 stated "students are expected to read the materials prior to coming to class" while syllabus 55 stated "students should read all materials before class as it will be useful for discussions during class."

Reflective Observation

Twenty two of the 78 syllabi included evidence that class discussions took place. Other opportunities for reflective observation were literature reviews with a reflection component in addition to annotated bibliographies. Reflection was evident in literature reviews based on requirements such as to include "a few sentences that reflect your personal opinion" (S15).

Response papers and lab reports were indicated in several of the syllabi. Syllabus 40 had a response paper assignment following field trips. The assignment description stated that "following the experience, students will write a response paper in which they reflect on their learning about current issues in small scale sustainable agriculture" (S40). In syllabus 50 a reflective paper was included in which "students will reflect on the work undertaken on their project, focusing on what they learned through the project and how the class can be improved in future semesters." Lab reports were found in several syllabi but did not include very descriptive evidence describing the components of the lab reports. Syllabus 47 and syllabus 79 explained the format of the lab report as being in the standard scientific format with an introduction, material and methods, results, and discussion.

Five of the collected syllabi contained the requirement that students bring in questions for class discussion based on the assigned reading. For example, syllabus 14 stated that students should be prepared to ask and answer questions based on the readings. Syllabus 18 included the suggestion that students review their class and reading notes in order to "raise questions and solidify your understanding." Similarly, in syllabus 24, students were told to "be prepared to ask questions about the material." Another major indication of reflective observation was the use of a field journal or similar tool. Twenty-one of the 78 total syllabi did not have evidence for reflective observation.

Abstract Conceptualization

Most of the syllabi did not have evidence for abstract conceptualization. Of the 31 syllabi that did have evidence, there were three main activities and assignments that indicated this stage in the experiential learning cycle. Opportunities for students to develop models and make hypotheses were made available through written assignments and projects with hypotheses components. Abstract conceptualization was represented by statements such as "learn how to formulate a researchable question" (S48) and by direct indication of the requirement to create and describe hypotheses in assignments.

Written assignments with a discussion or synthesis component was another form of abstract conceptualization that was found in several of the syllabi. Syllabus 6 included instruction for students to write a final synthesizing essay and in syllabus 51 students were instructed to write a final report based on small reports they had been writing throughout the course. Syllabi 76 and 77 went into greater detail about the requirements for the synthesis component to the written assignment. The components of this section were the following: "critically discuss the literature, build to support your assertion. Identify weaknesses and strengths and needs to be addressed in future research" (S76 & S77).

The other major indication of abstract conceptualization found in the assignments included in the syllabi was opportunities for students to make plans for future action. Plans included enterprise or production plans. One example of an enterprise plan was found in syllabus 10. The Sheep Enterprise Plan consisted of the assignment purpose, an explanation, and outline development. Another example of a production plan was found in syllabus 35. This assignment was called the Organic Production Plan. The details of this assignment were described in the following way:

> Each student will choose one product (vegetable, herb, fruit, mushrooms, etc.) for which to develop and organic production plan, from see/spore/cutting/etc. to final product. You will need to demonstrate in full detail how to produce this item according to the National Organic Program (NOP) standards. You should include a budget and a marketing plan, including projected production and sales. A detailed proposal page will be handed out in class. (S35)

Other cases of future plans were projects that required creating a future management plan, creating a farm production and management plan, generating a field plan, and a crop production plan.

Active Experimentation

Active experimentation was evident in the form of projects, oral presentations and group work. Thirty-three of the 78 syllabi included a project as part of the student assignments. Application of course concepts was seen in statements such as "this fall you will work in teams to develop a proposal to improve one area of the local food system in a way that is situated in the historical, scientific, and cultural contexts you will be studying this semester" (S16). Another project took place throughout the entire length of the course and included "quality of design, implementation, monitoring, and final crop quality." In addition to projects, 21 syllabi contained oral presentations. There were 18 syllabi that indicated group work. Group work represents opportunities for students to adjust to certain situations. There was no evidence for active experimentation in 24 of the 78 syllabi.

Conclusions

Evidence for each stage of the cycle was found in some of the syllabi. Concrete experience and active experimentation were more evident than reflective observation and abstract conceptualization. This indicates the need for the two underrepresented stages to be intentionally structured into course curricula.

Concrete Experience

Concrete experience took the form of direct interaction with the topic of study or observation. It was unclear if there was direct engagement in class and in other field experience as compared to direct interaction in the lab or farm setting. Though there was an emphasis in many of the courses for *hands-on* learning there is more to experiential learning than the act of just doing.

"Experiences in the classroom and field, experiential learning, and the opportunity to apply learned theory into practice" (Parr et al., 2007, p. 529) ranked highest in the types of teaching approaches that should be used in sustainable agriculture undergraduate education. Parr et al. (2007) suggested that students be given opportunities to interact with farmers, take field trips, directly participate at the farm, and do internships. The activities that emerged from the syllabi were very similar to those suggested by Parr et al. (2007).

Some syllabi had richer descriptions of the activities than others. In those syllabi that were not detailed, it was difficult to determine the degree to which students were involved and whether or not the activity fit with active experimentation or concrete experience. As explained by Parr and Van Horn (2006), "for experiential learning to be fully realized, the students' purposeful action or concrete experiences must be linked to an interactive cycle of reflective observation, abstract conceptualization, and experimentation" (p. 430).

Reflective Observation

Class discussion and reflective papers were the main forms of reflective observation that emerged from the syllabi. It was clear that some of these opportunities were intentionally included in the course to encourage reflective observation. Parr and Van Horn (2006) explained that experiential learning includes more than just experience but also encourages students to add to their existing knowledge and incorporate new experiences to prepare them for future experiences. There were a number of syllabi that did not indicate any opportunities for reflective observation, intentional or unintentional. This does not mean that reflective observation was not occurring in those courses. However, based on the evidence, this stage in the experiential learning cycle was not intentionally incorporated into the syllabi.

Based on Kolb's (1984) model of experiential learning, learners need the opportunity for reflective observation in order to "change or affirm the meaning made from prior experiences" (Perez, Parr, & Beckett, 2010, p. 111). Activities that emerged from the syllabi that have a high likelihood of allowing for reflective observation include reflective papers that encourage students to incorporate their personal insights and past experiences. In addition, class discussions in which students are required to bring in questions from reading or prior lectures are useful tools for enabling reflective observation to occur. Andreasen (2004) explained Joplin's (1981) perspective on reflection by stating "it is the reflecting upon the experiences received and relating them to our previous gained knowledge or information that distinguishes experiential learning from merely learning experiences" (p. 56).

Students should be guided to internalize the experience and analyze their observations and reactions to the experience (McMullan & Cahoon, 1979). According to Petkus (2000), reflective observation "involves watching, listening, recording, discussing, and elaborating, on the experiences" (p. 64). Activities should be incorporated into teaching farm courses that allow students to reflect on their concrete experiences and prepare them for the next stage of the learning cycle where generalizations are made.

Abstract Conceptualization

Both reflective observation and abstract conceptualization are the stages of the experiential learning cycle that are "cognitive in nature" (Roberts, 2006, p. 22). Due to the nature of this stage of the cycle, it was difficult to know for sure if opportunities for abstract conceptualization were built into the course syllabi. The abstract conceptualization stage of the cycle is necessary in order to incorporate new knowledge for use in future applications. It was evident in some syllabi that opportunities for synthesis and future planning, and therefore abstract conceptualization, were included. More than half of the syllabi had no evidence while the remaining syllabi had varying degrees of opportunities for abstract conceptualization. Abstract conceptualization was evident in student projects in several of the syllabi. This was especially true in projects in which students had to create plans or write reports that tied in course concepts and prior experiences. These opportunities most likely provided students opportunities for "refining the received knowledge and conceptualizing it with regards to other experiences" as well as opportunities for students to "tie the experience or learning into the educational or experiential paradigm" (Andreasen, 2004, p. 56).

The apparent lack of abstract conceptualization in sustainable agriculture courses will hinder students' ability to build knowledge. Instructors need to intentionally design their courses to include opportunities for students to make generalizations. This stage of the cycle prepares students to enter new experiences and test out their newly formed hypotheses based on prior experiences.

Instructors may need to take on the role of a facilitator and guide students through linking course concepts and theories to the students' personal experiences in the abstract conceptualization stage (Petkus, 2000). Instructors should talk through the thought process to bridge the reflective stage to the abstract conceptualization stage and do more than just state conclusions (Brock & Cameron, 1999). Students can look at specific situations analytically from a variety of perspectives to compare and contrast the strengths and weaknesses of each view point to achieve this stage of the cycle (Brock & Cameron, 1999). Identifying assumptions, building models, and developing hypotheses will allow students to make "meaningful interpretations of otherwise confusing experiences" (McMullan & Cahoon, 1979, pg. 455).

Active Experimentation

It was difficult to distinguish active experimentation from concrete experience. One of the criterions that were used to make this distinction was whether or not the activity was intended for application of knowledge or if it was a first exposure to something. This represents one issue that can arise when using Kolb's (1984) experiential learning model.

Projects and oral presentations were the main activities that constituted active experimentation. It was assumed that these opportunities, while they may offer new experiences, were intended to provide students opportunities to adjust to new scenarios and apply course concepts. Group work also represented active experimentation as there are ample opportunities in group work to acclimate to a variety of situations and incorporate multiple perspectives (Kolb, 1984).

Active experimentation is the stage of the experiential learning cycle in which learners test out their newly developed knowledge in new situations (Battisti, Passmore, & Sipos, 2008). Students working in a farm setting are given opportunities to respond to unexpected events due to the dynamic characteristics of the farm setting. Unexpected events allow students to be exposed to reality, gain confidence, learn to adjust to stress, become familiar with course material, and make decisions on how to respond and act (Millenbah & Millspaugh, 2003, p. 129). Knowledge should be built upon prior experiences, as reflected in the cyclical form of the experiential learning cycles (Kolb, 1984).

Implications

The difficulty of distinguishing active experimentation and concrete experience emerged based on the findings of this study. Roberts (2006) presented a two part model of experiential learning based on the works of Dewey (1938), Kolb (1984), Joplin (1981), and Dale (1946). This model looks very similar to Kolb's (1984) model however it combines the concrete experience stage with the active experimentation stage (Roberts, 2006). Based on this study, the use of Roberts' (2006) Model of the Experiential Learning Process has been found to be more useful.

Roberts (2006) described the experiential learning process as cyclical and spiral-like. This explanation accommodates for the activities found in the syllabi in this study since many of the activities and topics built off of each other and progressed throughout the courses. The stages are in a specific order in both Roberts' (2006) and Kolb's (1984) models for experiential learning. However, as explained by Kolb (1984) and as found in this study the process may not always occur in the order illustrated in the models. It was also difficult to decipher the order of activities and progression through the cycle based on syllabi alone. The models act as guides that are useful in planning and evaluating curricula.

The cognitive stages of experiential learning theory, reflective observation and abstract conceptualization, can occur away from the direct experience (Kolb, 1984; Roberts, 2006). Because of this it was not always clear in the syllabi if opportunities for these stages were present or intentionally built into the course structure. The inclusion of these stages is imperative to the progression of the cycle and the overall learning experience.

Using syllabi as the data source offered a limited view of what is occurring at teaching farms. The researcher had to make assumptions of what the instructor was intending for the activities in order to assign what stage of the cycle was being represented. Due to the limitations of the data source it was difficult to fully know what is truly occurring in the courses that were represented by the collected syllabi. It was clear that syllabi were often lacking information to allow for a full picture of what occurs. However, the more detailed syllabi offered enough information to suggest that experiential learning is taking place or at least is intended to take place.

Overall, the majority of courses that use teaching farms included in this study had evident concrete experience and active experimentation activities. Reflective observation and abstract conceptualization were present in several syllabi. However, these cognitive based stages need to be encouraged and designed deliberately into the curricula in order to provide students with the proper tools to prepare them for their future careers.

Curricula that are structured around the experiential learning cycle will give students the opportunity "for examining and strengthening the critical linkages among education, work, and personal development" (Kolb, 1984, p. 4). The presence of experiential learning in sustainable agriculture curricula allows students to add to their sense of purpose (Parr & Van Horn, 2006) and prepare them for life-long learning (Kolb, 1984). Sustainable agriculture curricula should be designed closely following the experiential learning model. Initial experiences should be planned with the intention of allowing students to build on to the experience and gain knowledge. The initial experience should be followed by reflective opportunities including guided discussion, journaling, and reading of supporting materials. Students should be given opportunities to analyze, compare and contrast, create models, and integrate theories into specific contexts in order to move into the generalization stage (Petkus, 2000). Newly developed theories and generalizations should be tested in other experiences that are comparable but different than the initial experience. Instructors will need to take on several roles including facilitator and instructor throughout the learning experience.

Recommendations

Additional research should include a study that uses interviews or focus groups with teaching farm faculty, staff, and students to determine what is occurring at teaching farms and how teaching theory is applied. How intentional faculty are at incorporating the stages of the experiential learning cycle should be assessed. Direct observation of faculty teaching at teaching farms should be done to ascertain what is truly occurring in the teaching farm courses. A similar study should be conducted using additional curricula materials with the Roberts (2006) model of experiential learning to more richly assess what is occurring in teaching farm courses. Partnerships should continue to be held and formed by those doing research and those utilizing teaching farm curricula. Institutions of higher education as well as SARE and SAEA should be in collaboration to decide what information would be most advantageous for the future of sustainable agriculture education through teaching farms.

Teaching theory such as experiential learning should be intentionally used to design curricula in addition to being used in practice during courses at teaching farms. Faculty that design and implement sustainable agriculture curricula at teaching farms should be cognizant of when activities are intended to facilitate students to enter the reflective observation and abstract conceptualization stages of the experiential learning cycle. Instructors should design their curricula with evaluation in mind in order to monitor that students are fully cycling through the experiential learning process. These indications will help the instructor to be aware that what they are intending for the students is actually occurring. A major part of experiential learning theory is that students have the opportunity to direct their own learning. Opportunities for students to choose and make decisions about what and how they learn should be incorporated into teaching farm courses.

References

Andreasen, R. J. (2004). Integrating experiential learning into college of agriculture capstone courses: Implications and applications for practitioners. *NACTA Journal*, *48*(1), 52-57. Retrieved from http://nacta.fp.expressacademic.org/article.php?auto ID=445&issueID=113

Ary, D., Jacobs, L. C., Razavieh, A., & Sorensen C. (2005). *Introduction to Research in Education (*7th ed). Belmont, CA: Thomas Wadsworth.

Battisti, B. T., Passmore, C., & Sipos, Y. (2008). Action learning for sustainable agriculture: Transformation through guided reflection. *NACTA Journal*, *52*(2), 23-31. Retrieved from http://nacta.fp.expressacademic.org/article.php?autoID=116&issueID=67

Beard, C., & Wilson, J. P. (2006). *Experiential learning: A best practice handbook for educators and trainers*. Philadelphia, PA: Kogan Page.

Brock, K. L., & Cameron, B. J. (1999). Enlivening political science courses with Kolb's learning preference model. *Political science and politics, 32*(2), 251-256. Retrieved from http://www.jstor.org/stable/420560

Campbell, J. R. (1998). *Reclaiming a lost heritage: Land-grant & other higher education initiatives for the twenty-first century*. East Lansing, MI: Michigan State University Press.

Dale, E. (1946). *Audio-visual methods in teaching.* New York, NY: The Dryden Press.

Dewey, J. (1938). *Experience and education*. New York, NY: Touchstone.

Dillman, D. A., Smyth, J. D., & Christian, L. M. (2009). *Internet, mail, and mixed-mode surveys: The tailored design method.* Hoboken, NJ: John Wiley & Sons, Inc.

Dimitri, C., & Oberholtzer, L. (2009). *Marketing U.S. organic foods: Recent trends from farms to consumers.* USDA Economic Research Service, Economic Information Bulletin #58. Retrieved from http://www.ers.usda.gov

Earles, R. (2005). *Sustainable agriculture: An introduction*. Retrieved from ATTRA website: http://attra.ncat.org/attra-pub/PDF/sustagintro.pdf

Food and Agricultural Organization. (2002). *Organic agriculture, Environment, and food security*. Retrieved from http://www.fao.org/DOCREP/005/Y4137E/y4137e02.htm

Gall, M. D., Gall, J. P., & Borg, W. R. (2007). *Educational Research: An Introduction* (8th ed.) Boston, MA: Pearson Education, Inc.

Gold, M. V. (1999). *Sustainable agriculture: Definitions and terms* (Special Reference Briefs Series no. SRB 99-02). Retrieved from http://www.nal.usda.gov

Gold, M. V. (2007) O*rganic production and organic food: Information access tools*. Retrieved from http://www.nal.usda.gov/afsic/pubs/ofp/ofp.shtml.

Grant, P. M., Field, T. G., Green, R. D., & Rollin, B. E. (2000). The importance of comprehensive agricultural education in land-grant institutions: A historical perspective. *Journal of Animal Science, 78,* 1684-1689. Retrieved from http://jas.fass.org/cgi/reprint/78/6/1684.pdf

Hillison, J. (1996). The origins of agriscience: Or where did all that scientific agriculture come from? *Journal of Agricultural Education*, *37*(4), 8-13. doi: 10.5032/jae.1996.04008

Joplin, L. (1981). On defining experiential learning. *Journal of Experiential Education, 4*(1), 17-20.

Kolb, D. A. (1984). *Experiential learning: Experience as the source of learning and development.* Upper Saddle River, NJ: Prentice Hall.

Leis, A. E. (2008). *Student farms at United States colleges and universities: Insights gained from a survey of their managers*. (Unpublished master's thesis). Columbus, OH.

Lieblein, G., Østergaard, E., & Francis, C. (2004). Becoming an agroecologist through action education. In J. Pretty (Ed.), *Sustainable agriculture and food: Policies, processes, and institutions, Vol 4.* (pp 290-299). London, UK: Earthscan.

Lincoln, Y. S., & Guba, E. G. (1985). *Naturalistic inquiry*. Newbury Park, CA: SAGE Publications, Inc.

Marcus, A. I. (1986). The ivory silo: Farmer-agricultural college tensions in the 1870s and 1880s. *Agricultural History, 60*(2), 22-36. Retrieved from http://www.jstor.org/stable/pdfplus/3743428.pdf?acceptTC=true

McMullan, W. E., & Cahoon, A. (1979). Integrating abstract conceptualization with experiential learning. *The academy of management review*, *4*(3), 453-458. Retrieved from http://www.jstor.org/stable/257203 .

Merriam, S. B. (1998). *Qualitative research and case study applications in education.* San Francisco, CA: Jossey-Bass.

Millenbah, K. F., & Millspaugh, J. J. (2003). Using experiential learning in wildlife courses to improve retention, problem solving, and decision-making. *Wildlife society bulletin*, *31*(1), 127-137. Retrieved from http://www.jstor.org/stable/3784366

Parr, D. M. (2009). *Student farmer-to-student farmer: Transformational learning in sustainable agriculture and food systems education*. (Doctoral dissertation). Retrieved from Proquest. (3385713).

Parr, D. M., Trexler, C. J., Khanna, N. R., & Battisti, B. T. (2007). Designing sustainable agriculture education: Academics' suggestions for an undergraduate curriculum at a land grand university. *Agriculture and Human Values*, *24*, 523-533. doi 10.1007/s10460-007-9084-y

Parr, D. M., & Van Horn, M. (2006). Development of organic and sustainable agricultural education at the University of California Davis: A closer look at practice and theory. *HortTechnology,16*(3), 426-431.

Perez, J., Parr, D., & Beckett, L. (2010). Achieving program goals? An evaluation of two decades of the Apprenticeship in Ecological Horticulture at the University of California, Santa Cruz. *Journal of Agriculture, Food Systems, and Community Development, 1*(1), 107-124.

Petkus, Jr., E. (2000). A theoretical and practical framework for service-learning in marketing: Kolb's experiential learning cycle. *Journal of marketing education, 22*(1), 64-70. Retrieved from http://proquest.umi.com/pqdlink?did=52570575&F mt=6&clientId=20179&RQT=309&VName=PQD

Rasmussen, W. D. (1989). *Taking the university to the people: Seventy-five years of Cooperative Extension*. Ames, IA: Iowa State University Press.

Redden, E. (2009). *Green revolution*. Retrieved from Inside Higher Ed website: http://www.insidehighered.com/news/2009/04/23/agriculture

Reiling, B.A., Marshall, T. T., Brendemuhl, J. H., McQuagge, J. A., & Umphrey, J. E. (2003). Experiential learning in the animal sciences: Development of a multispecies large-animal management and production practicum. *Journal of Animal Science, 81*(12), 3202-3210. Retrieved from http://jas.fass.org/cgi/content/full/81/12/3202

Roberts, T. G. (2006). A philosophical examination of experiential learning theory for agricultural educators. *Journal of Agricultural Education, 47*(1),17-29. doi: 10.5032/jae.2006.01017

Sayre, L. (2005). *The NEWFARM: A directory of student farms*. Retrieved from http://newfarm.rodaleinstitute.org/features/0104/studentfarms/studentfarms.shtml

Schroeder, M. S., Creamer, N. G., Linker, H. M., Mueller, J. P., & Rzewnicki, P. (2006). Interdisciplinary and multilevel approach to organic and sustainable agriculture at North Carolina State University. *HortTechnology, 16*(3), 418- 426.

Thompson, B. (2009). *Educational and training opportunities in sustainable agriculture*, 19th ed. Retrieved from http://www.nal.usda.gov/afsic/pubs/edtr/EDTR2009.shtml

United Nation Development Programme. (2010). *Millenium development goals*. Retrieved from http://www.undp.org/mdg/basics.shtml

United States Department of Agriculture. (2009). *Sustainable agriculture*. Retrieved from http://www.csrees.usda.gov/nea/ag_systems/in_focus/sustain_ag_if_organic.html

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